SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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PASTEUR.

If the measure of human greatness is to be found in the amount of blessedness that a man's life and work bring to his fellowmen, there has lately passed from our midst one of the greatest of all great men. The moral philosophers tell us that the pursuit of pleasure and the avoidance of pain are chief among the natural instincts of man. If this be so, Pasteur has done more to ameliorate the condition of the race than any one man, living or dead. And it was all done so quietly. There was no ostentation; no preliminary flourish of trumpets; none of that striving for dramatic effect which is popularly, and we think all unjustly, supposed to characterize the people among whom he lived, worked, and died.

A man of firm convictions, unwearying patience, indomitable courage, and with unlimited capacity for work, he lived in the laboratory. In its quiet seclusion he wrestled with and conquered problems that had baffled the most learned savants of his own and all previous ages.

Born at Dole, France, on December 27, 1822, he early showed a love for the study of chemistry. He entered the Ecole Normale at Paris, where he followed up his researches in his chosen line, and afterward at Sorbonne he further prepared himself under the tuition of M. Dumas, whom he was to succeed in later years at the Academie Francaise.

Pasteur's first great work was accomplished in the years 1865-66, when he was called upon to investigate the silkworm plague, which was destroying one of the great industries of France. He at once stated that the plague was due to a parasite, and that it could be stopped by destroying all worms and eggs that were affected. This statement was met with ridicule. He was told that the pest would still be propagated by spontaneous generation. Pasteur denied that there was such a thing as spontaneous generation. He proved the truth of his theories, his advice was followed, and the plague was checked.

He then turned his attention to the phenomenon of fermentation, alleging that it was caused by animalcules. He claimed that if all germs could be excluded, fermentation would be impossible. Again he was met with ridicule, and with the old cry of "spontaneous generation." To prove his point he carried out experiments in pure mountain air; and he showed conclusively that at that altitude where the air was free from germs no fermentation did or could occur; and that, therefore, "spontaneous generation" was, as he had all along contended, a myth.

It was a natural sequence to these successful experiments, that Pasteur should next investigate the diseases of men and animals.

He had already proved that the deadly silkworm plague was due to the action of living organisms; he now argued that the contagious and infectious diseases of men and animals were probably caused and sustained in the same way. His investigations proved the theory correct; and he soon had brought a large number of the deadly diseases within control.

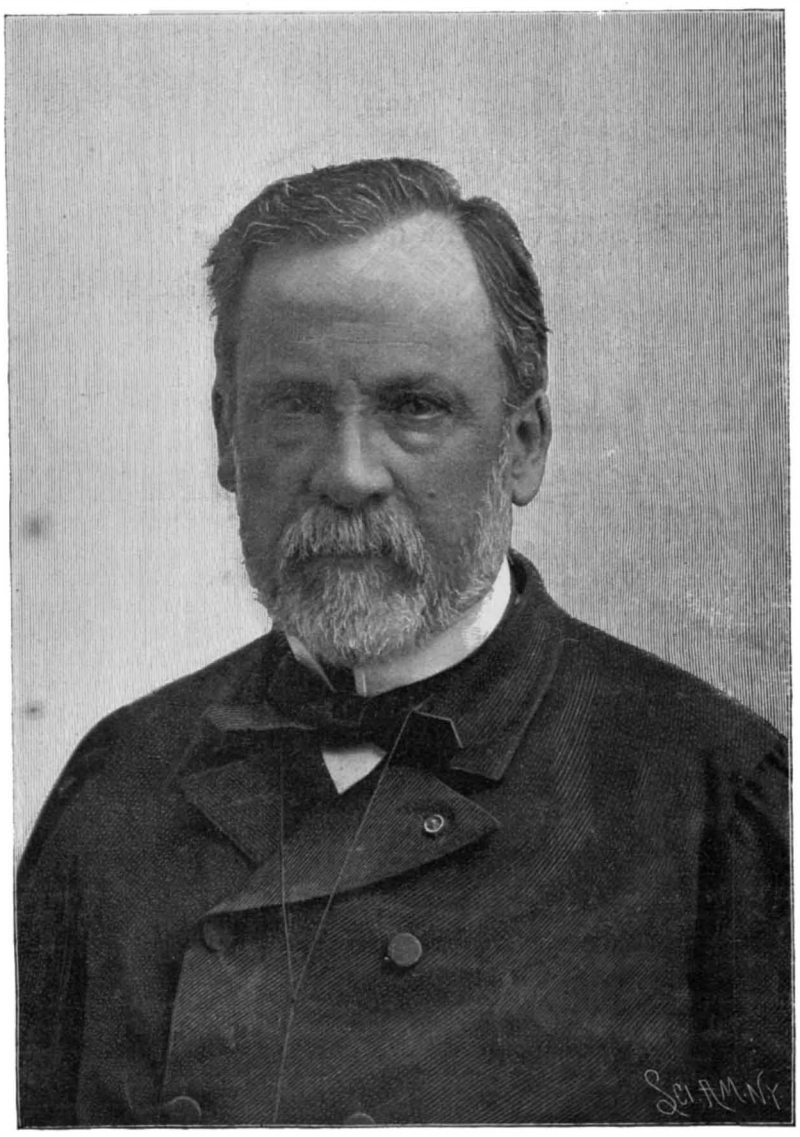
The investigations of his later life were directed more particularly to the cure of that horrible malady hydrophobia. For a while public opinion, both lay and professional, was divided as to the merits of his cure. To-day, however, there is a wide and increasing belief in its efficacy. From all parts of the world victims of the hydrophobic bite are flocking to the famous institute for treatment. It is a fact that no patient who goes there sufficiently soon after being bitten to give the treatment time to grapple with the poison is ever known to die in the hospital.

Louis Pasteur is the father of the "germ theory" of diseases. Previous to his discoveries the practice of medicine in treatment of diseases was largely "guesswork." Necessarily so; for how shall a man treat correctly a disease the essential nature of which is a mystery to him?

Physicians were groping in the dark; wrestling blindly with a foe that they could not see, and that was manifest to them only by its fatal effects. Pasteur has thrown the clear light of science upon this foe, and has shown to the medical world its origin, its method of growth, and the extent of its powers; and, best of all, he has put into the hands of the physician a sure means for its extermination.

Diphtheria, cholera, and hydrophobia have been stripped of their terrors; consumption soon will be; and it is reasonable to expect that before another decade has gone by there will not be a single disease that is not fully under the control of the physician.

Such was the life-work of Pasteur. He is dead; but his healing touch will be felt to the end of time. If ever fame can render a man "immortal," it will be to Louis Pasteur that the generations to come will give the title with grateful reverence.



PASTEUR.

The Cost of Pauperism.

A British blue-book has just been issued containing the poor rate return for the year ended Lady Day, 1894. The principal items of expenditure were: In maintenance, £2,198,312; out-relief, £2,460,503; maintenance of lunatics in asylums or licensed houses, £1,466,185; workhouse or other loans repaid, and interest thereon, £677,082; salaries and rations of officers and superannuation allowances, £1,629,061; other expenses, £1,242,362; total, £9,673,505, or $48,367,525. In comparing the expenditure of 1893 with that of 1894, under every item in the latter year there was an increase.

What Electricity is Doing.

The Mining and Scientific Press thus sums up the uses to which electricity is applied. It enters into the preparation of what we eat, drink and wear, and there are many articles of utility now produced by its aid. The residents of many cities in the United States have their houses protected, lighted and heated by electricity. They go to their places of business in cars run by electricity, the elevator by which they reach their office in high buildings, or the machinery in their factory, is run by electricity. The bell which summons them to church is rung by electricity and the church organ is played by electricity. Electricity brings the news to them from all parts of the earth; stamps their letters, automatically sounds the alarm in case of fire, rings the door bell, cooks the food, and fans them while eating it. When they go to the dentist their teeth are drilled and filled by electricity, and miniature electric lamps are now constructed for the use of doctors in diagnozing diseases. The patient swallows a lighted lamp, which illuminates his person so as to enable the physician to make a correct diagnosis. The barber cuts or singes the hair by means of electricity, the streets are lighted and the farm cultivated by it. By means of it we can talk with our friends 500 or 1,000 miles away and hear their voices as distinctly as though they were in the same room. The telephone is perhaps in more general use in this country than electric lighting. Even in small towns telephones form a part of the furniture of many private houses, and are used to transmit orders to the butcher, baker, etc. There are now some 85 electric railways in the United States and 9,000 miles of track employing 23,000 cars. With the aid of electricity natural forces which have heretofore run to waste are being turned to the service of mankind. The American River has already been made to furnish motor power by which Sacramento is lighted, and by which its street cars and factories are run, and new projects are in progress all over the State.

The Inventor of the Polka.

"The origin of the polka is not generally known, the inventor of the dance having been a young Bohemian girl named Haniczka Selezka. She was a blooming young peasant maiden, and the best dancer in the village of Costelec, on the River Elbe, and used to perform solo dances of her own invention at the various village festivities. It was in the year 1830, at a farmhouse, that the assembled guests asked her to dance a solo, and she said, 'I will show you something quite new,' and to the music of her own singing she danced the polka step, though with more elaboration than it is now performed. The dance became so popular that it was later made a national dance, and Haniczka named it Pulku, as she said it was danced in short steps; from Pulku came Polku, and finally Polka, the dance three years later, in 1830, becoming popular in Prague, and in 1839 it was already danced at the Vienna balls, and one year later became the most popular dance in Paris. Haniczka Selezka is still alive, surrounded by numerous grandchildren and great-grandchildren sprung from her own six sons and daughters."—The Etude.

ASTHMA.—At the moment of the attack spray rapidly the back of the patient with chloride of methyl, from above downward and from below upward. The attack will cease in a few moments; if not, spray lightly the upper part of the chest. If the skin be delicate, as in women, cover the parts with a bit of fine gauze and make the strength of the spray proportionate to the strength of the patient and the violence of the attack —Tsakiris, Medical Record.

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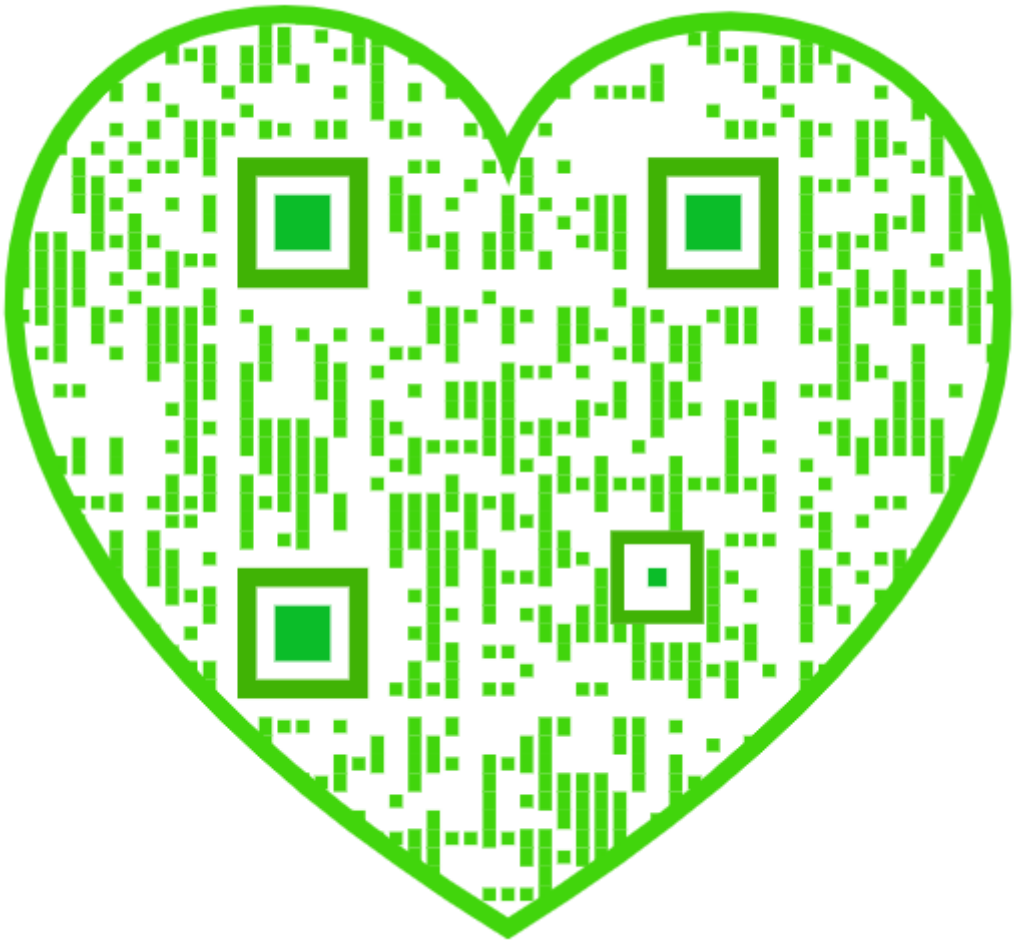

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THE RETURN OF LIEUTENANT PEARY.

In the month of July, 1893, Lieutenant Peary set out on the second of his famous expeditions to the Arctic regions. On Saturday, September 21, the steam whaler Kite, which started on July 10 previous, with a relief party, steamed into the port of St. Johns, N. F., with the intrepid explorer on board. This was the second time that the Kite had performed this good service for the explorers. Lieutenant Peary's first journey was begun in June, 1891, and he was brought back by the Kite on September 11, 1892.

In the earlier expedition the Lieutenant had discovered and named Independence Bay, on the northeastern coast of Greenland. He proved by this discovery that Greenland was an island. His intention on his second expedition was to cross over the inland ice to Independence Bay, 650 miles distant, taking a route midway between his former outward and homeward tracks.

The bitter cold proved too much for the party; and after their return all of the members of the expedition except Peary, Lee, and Henson, Peary's servant, returned on the Falcon to America, in August, 1894. On March 22 of this year the intrepid party of three again started for Independence Bay: which point they reached with difficulty in June. Here he failed to find a food supply that had been left by the previous exploring party, and reluctantly his project of pushing on from this point to the far north had to be abandoned. The return trip was full of suffering and want. They had to shoot the forty-nine sleigh dogs, one by one, to maintain the strength of those that remained. They put themselves on reduced rations of one meal of pemmican a day. Too weak to drag the sledges, they threw away their instruments, rifles, and extra clothing. On July 25, "after having eaten every morsel of food, three starving men and one dog staggered into Anniversary Lodge after a journey of 650 miles, not having tasted a morsel of food for the thirty-six hours before arriving." It is considered by the scientific and geographical societies that the results of Lieutenant Peary's indomitable labors in these two expeditions are well worth the money and hardship that they have cost.

Although the second attempt at exploration added little to our store of geographical knowledge, it was rich in scientific results. The party that returned home in 1894 brought with them a large number of specimens that will add greatly to our knowledge in the fields of natural science.

THE NEW MAXIM GUN OF SOLID STEEL.

Mr. Maxim, whose versatile genius is just now displaying its power in the two widely different fields of aeronautics and heavy rifled ordnance, has lately produced a 5·7 inch 45 pounder gun that promises to revolutionize the art of gun manufacture. He proposes to manufacture guns from one solid integral forging, and thereby supersede the present expensive and tedious system of "building up." It is well known that the present "built-up" gun consists of an inner core or tube, which extends the full length of the gun, over which are shrunk successively a series of concentric "jackets" or outer tubes. This is done in order that the whole mass of metal in the thickness of the gun may be thrown into a state of tension, and may be ready to receive and resist instantaneously the bursting strain that is set up at the moment of firing. Were it not for this initial tension the bursting effect of the charge would all be thrown upon the layer of metal that was next the bore, which would be ruptured before the next outlying mass of metal could assist in resisting the strain. In the built-up gun, as a result of the initial tension, every particle of metal from the center to the circumference is firmly gripping the bore; and the shock of discharge is felt and resisted instantaneously by the whole mass of the gun.

In the built-up gun, the work of carefully boring out and shrinking on the jackets is tedious and costly. Mr. Maxim saves this large item of expense. In his system the forging is roughly turned and then annealed in a slow furnace. It is next carefully turned, smooth bored, and rifled. It is next mounted vertically in a special furnace and rotated slowly, and a current of coal gas is forced through the bore. The carbon in the gas combines with the steel of the bore, hardening it and improving the quality of the steel. "When the gun was red hot," says Mr. Maxim, "the coal gas was shut off and a very large stream of cold oil, under high pressure, was forced through the bore." This cooled the bore and the inside shrank to its finished dimensions. The outside body of the gun now gradually shrank upon the cooled interior portion, and was thus thrown into a state of high tension. It was found that the metal of the bore was compressed 0·02 of an inch.

In the firing tests a 45 pound projectile was fired with a muzzle velocity of 2,200 feet and a pressure of 15 tons to the square inch. In the later proof charges a pressure of 22½ tons to the inch was reached. The guns stood the test excellently. One of them was 0·002 of an inch smaller after firing than before, showing that the enormous outside tension of the gun, assisted by the concussion of the discharge, actually compressed the bore to a smaller diameter. If such guns can be made without any undetected flaws in the metal, it is evident that heavy ordnance can henceforth be manufactured in half the time and at half the expense of the present built-up system.

THE OFFICIAL PHOTOGRAPHIC COMPANY OF THE COTTON STATES EXPOSITION.

We are the well wishers of the Cotton States Exposition; and, as such, we feel called upon publicly to express our surprise and regret that the management of this enterprise should have put a vexatious stumbling block in the way of publications such as the SCIENTIFIC AMERICAN, in the matter of illustrating the various buildings and exhibits of the Exposition.

It had been our intention to illustrate very fully the progress of the South as shown at Atlanta, and for this purpose we had sent our special artist to the grounds with instructions to illustrate freely the most interesting features of the Fair. We find, however, that our intention is confronted point blank with a cast iron agreement that must be made with a certain Official Photographic Company before a photograph or a sketch can be made in the grounds. It would seem from the wording of the blank "agreement" that the Department of Publicity and Promotion has leased the privileges of photography and illustration to what is styled an Official Photographic Company, "having certain exclusive photographic privileges on the grounds of said Exposition Company."

Before the illustrated press can make even so much as a sketch on the grounds, it has to make application to this photographic company, agreeing as follows: "That all pictures taken shall be submitted to the Official Photographic Company, which shall decide if it is the desire of said company to copyright such picture, which said company may do; that should we" (the press) "desire to purchase from said official company any" of our own "copyrighted photographs, we will preserve the same from any other use than that for which they are bought, to wit for illustrating said Exposition in the columns of said publication only; that after any negatives bought from said company have served the purpose of illustrating, all such negatives shall be destroyed; that we will not permit any such negatives to be used in any other publication whatsoever."

Now we had hoped that the blunder which the directors of the Chicago Exhibition made in this matter (and which they had the good sense later on to modify) would be avoided at Atlanta.

The lavish illustration of this exposition in papers with a circulation such as that of the SCIENTIFIC AMERICAN gives to an enterprise like this an amount of free advertising and indorsement that it could scarcely get in any other way, and surely the very least return that the directors could make would be to give the illustrated press every possible facility and assistance in their work of illustration. It seems to us that the mere promptings of courtesy would suggest such a course.

Instead of this, we are confronted with an impossible agreement, which we are supposed to enter into with a certain company, which has leased the photographic privileges for the sole purpose of coining every dollar possible out of the bargain.

The power of copyright, as mentioned in the agreement, is vexatious as it stands; but when it is supplemented with a provision that after illustration such negatives, pictures, et cetera, shall be destroyed, the matter verges on the ridiculous, and shows, at least, that the managers of the Atlanta Exposition are thoroughly ignorant of the working of an illustrated newspaper office. The provision that such illustrated paper "will not permit any such picture to be used in any other publication whatsoever" is equally ridiculous and impossible. There is not a day passes that we do not receive requests from all over the world for permission to reproduce our illustrations in other journals. It is certain that, for the mere pecuniary benefit of an Atlanta Exposition concessionaire, we are not prepared to place illustrations in our journal which will be closed against similar requests from our contemporaries in the future.

The revenue derived by the Exposition from this concession cannot be very large. Certainly it cannot be large enough to compensate for the serious curtailment that it will produce in the amount of space that will be devoted by the illustrated press to the interests of the Exposition.

Considered merely from the standpoint of finance, the policy is shortsighted, and defeats the very end at which it aims. At best the revenue derived from this concession can be but limited; whereas the free advertisement, both pictorial and written, by illustrated journals, such as our own, would interest the public and undoubtedly bring many thousands to the fair who otherwise, but for the suggestion, would stay away. It is evident that the revenue derived from such visitors would far exceed the paltry sum which this vexatious and ill-

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conceived concession will bring to the exposition exchecquer.

The Cotton States exposition has opened auspiciously. The executive body has shown itself capable and, except in regard to the matter under discussion, possessed of good judgment. We hope that, following the example of Chicago, they will remove this embargo in full or in part, at least so far as to leave to the illustrated press representatives a free hand in their work.

THE RETURN OF FAYE'S COMET.

On November 22, 1843, at Paris, M. Faye discovered the comet which bears his name. Astronomers predicted that the periodic time of the comet would be $7\frac{412}{1000}$ years, and with precise regularity it has made its appearance at the predicted intervals.

The time for its appearance has again come round, and again the marvelous accuracy of astronomical calculation has been verified. On October 3 the following dispatch appeared in the New York Herald: "Kiel, September 28, 1895. The periodical comet of Faye was discovered by Professor Javelle, of Nice, on September 26."

At the time of its discovery by M. Faye, M. Leverrier offered the theory that it had been revolving in an orbit since 1747, at which time it may have passed so near to Jupiter as to have its orbit completely changed. Since its discovery, careful observations have been made at every return to perihelion, and it will receive very careful observation on this, its eighth observed visit.

In former ages the approach of a comet produced a state of superstitious fear in the minds of the people; the celestial apparition was regarded as a sure portent of disaster. In this later age the interest is unabated, but superstition has given place to science; and the strange visitant is welcomed as a possible teacher of new facts regarding the vast solar system to which our earth belongs.

Owing to their eccentricity of motion, and the remarkable beauty of their appearance, comets have always excited a widespread interest on their periodic return. Unlike the planets, they move in flat ellipses, having the sun near one end. They move in obedience to the law of planetary motion, their speed quickening as they approach the sun, and diminishing as they retire into space. What the actual composition of the comet is has never yet been definitely determined. They appear to be made up of a body or denser part, known as the nucleus, and a less dense and less luminous tail. The consensus of scientific opinion inclines to the theory that they consist of meteoric particles, varying in size from that of the largest meteors down to the finest meteoric dust. These particles are supposed to be widely separated from each other and to be each surrounded with an envelope of luminous gas. The head or nucleus is probably formed of the larger particles lying in closer propinquity, the size of the fragments diminishing toward the tail, where they are widely scattered.

THE AUTHORSHIP OF THE KEROSENE OIL SPRAY.

In the SCIENTIFIC AMERICAN of September 28, in the biographical notice of the late Prof. Riley, it is stated that "two of his studies have produced epoch-making results. One is his famous emulsion of kerosene oil, milk or soap solution being the emulsifying agent. Having found that this was an infallible insecticide, he had to devise means for applying it, and invented the 'cyclone,' 'eddy chamber,' or 'Riley system' of nozzle for spraying it upon trees."

A valued correspondent calls our attention to the decisions of the Commissioner of Patents, July, 1892, which show that these claims on behalf of Prof. Riley cannot be sustained.

The actual author of the inventions in question, as shown by the evidence, was Prof. William S. Barnard, and it was so adjudged by the Patent Commissioner. The patents are now held by Mrs. Barnard, and their validity is not disputed.

It further appeared from the evidence that Prof. Riley himself had at various times in the early history of the inventions freely admitted the authorship of Prof. Barnard, and had repeatedly given to him due and public credit therefor.

It is not denied that Prof. Riley did much by his writings and addresses to introduce the inventions and cause their adoption as the best known means of destroying noxious insects and saving crops and trees from their ravages, which sometimes entailed losses counted by millions of dollars. But, however useful and valuable Prof. Riley's labors were in this respect, the honors for the actual discovery of the method and the means unquestionably belong to Prof. Barnard.

Professor Elliott A. Rogers.

The New York World gives the following account of the demise of this talented man of science, which occurred October 2: "Elliott A. Rogers, instructor of chemistry at Harvard College, dismissed his class in Boylston Hall this afternoon in his usual manner and turned toward an adjoining room. A glass beaker containing some chemical was in his hand, and in the other was a piece of paper on which, as subsequently appeared, was written: 'It is as it should be.' Before the members of the class had all passed through the door Instructor Rogers uttered a groan and sank to the floor. His students rushed to his side to find him dead.

"The tragedy is a mystery. None of the students knew what chemical was in the glass beaker that he held in his hand when he closed the lecture. Nobody knows the significance of the words on the piece of paper which he held in the other hand. His friends scout the idea of suicide, and assert that the vapor arising from the unknown chemical must have affected his heart.

"It was noticed to-day that he was very pale when he entered the classroom, and it was commented upon by the students. He conducted his class as usual, however, and then took up the mysterious beaker with its deadly contents. It is believed by many that the words on the scrap of paper indicated the completion of certain experiments.

"It is known that Professor Rogers was deeply interested in quick-acting poisons. He knew thoroughly the action of every gas and poison and every chemical combination upon the heart. He knew just how many fractions of a second it would take to still the beating of the heart after the administration of the poison. So it seems highly improbable that death was the result of an accidental inhalation of poisonous vapors.

"Professor Rogers had been experimenting with cyanide of potassium, noting carefully its action on various metals. Whether or not he had discovered a new chemical action will probably never be known. He did not speak after being stricken. Death was instantaneous. Cyanide of potassium acts in just that way, so it is highly probable that that was the poison that caused his death. If that be so, it is doubtful if the autopsy will throw any light on the matter, for it is well known that this poison leaves but one slight trace of its work, and that is not always distinguishable. Examiner Durell will hold the autopsy to-morrow.

"Mr. Rogers was about thirty-five years of age. He came to the college from Worcester. He graduated in 1891, and since that time had traveled extensively in Germany and other foreign countries. He studied chemistry while abroad and was considered one of the shining lights in this branch of education."

Science Notes.

A New Standard of Light.—Mr. Violle, says the Revue Industrielle, has undertaken some researches upon acetylene that have led to the manufacture of a standard lamp that fulfills all the conditions required by the ordinary photometric measurements. Upon burning the gas under a slight pressure in a burner in which it is properly aerated and that spreads it out into a wide, thin sheet, Mr. Violle obtains a steady and very luminous flame of remarkable whiteness and of uniform clearness over quite a wide surface. In front of this flame he places a screen provided with an aperture that varies according to requirements, and obtains a source whose steadiness and brightness, comparable with those of the absolute standard, make a practical standard of it.

A New Steam Pipe.—Mr. Smillie, an engineer of Glasgow, has recently patented a steam pipe that is capable of resisting very high temperatures. Each pipe consists of a copper tube around which steel wire is wound in such a way that there is a perfect contact between the two metals. The soldering is easily effected by immersing the whole in a fusible alloy, whose melting point is higher than the elevated temperature of the supercharged steam.

Ancient Thermometers.—A short time ago, Mr. Maze described what was probably the first mercurial thermometer, and he now gives (Comptes Rendus, cxxi, 230) particulars of the first alcoholic thermometer used in Paris. During the year 1657, the Queen of Poland sent an envoy named Buratin on a mission to Italy, and he brought back numerous presents from the Grand Duke of Tuscany, among which there were several thermometers. One of these was afterward sent to Ismael Boullian, of Paris, and is described as being like the modern form, but with a somewhat flattened bulb. The alcohol was not colored, and the tube was exactly a decimeter in length, being graduated with marks in black enamel. Every tenth mark, however, was larger than the rest and in white instead of black enamel.

New Method of Soldering Lead to Lead.—According to the Revue Industrielle, Mr. Blondel solders lead to itself by making use of an amalgam of the metal. The two pieces to be soldered are first carefully cleaned by scraping. Then there is interposed between them a thin layer of lead, and an ordinary soldering iron is passed over the line of junction. The heat disengages the mercury of the amalgam, and the lead, set free in a state of minute division, enters into fusion and solders the two sheets in the same way as is done by the ordinary method.

Method of Verifying the Quality of Alcohol.—According to Cosmos, Dr. Coiffier has recently made known a very simple process of quickly verifying the quality of alcohol. The process consists simply in igniting in a saucer twenty grammes of the alcohol to be tested and in attentively examining the different phenomena that occur during the combustion. The purest alcohol burns with a uniform blue flame without smoke, in disengaging an agreeable odor, and without leaving any residue. Now, there is none of the substances used for sophisticating alcohol that does not modify the method of combustion of the latter. Thus the inferior alcohols, the ethers, the fatty acids, all oleaginous substances, essence of turpentine, benzine, etc., even in extremely minute quantity, cause the appearance in the blue flame of long white or yellow fugacious trains of light that stand out clearly from the blue ground of the flame. The presence of foreign substances in alcohol also renders the flame of the latter smoky, as may easily be seen by holding a cold saucer over it. If the alcohol is supercharged with foreign substances, the saucer will become covered with a more or less abundant carbonaceous deposit.

Nitrogen and Phosphorescence.—Mr. G. Seguy has discovered that a phosphorescence similar to that caused by the electric discharge in tubes containing rarefied oxygen may be produced, in the case of nitrogen and its compounds, in the presence of the vapor of a metallic bichloride, as, for example, that of tin. The light emitted by the nitrogen tube is rose colored during the discharge; while with oxygen it is dull violet. The phosphorescence, which persists for some time after the interruption of the current, is of a milky whiteness.

Novel Galvanic Cell.—Mr. Morisot makes a new battery cell as follows: The positive pole is a plate of retort carbon placed in an external vessel containing a mixture of sulphuric acid (1 volume) and water previously saturated in the cold with potassium bichromate (3 volumes). The porous cell contains a dilute solution of caustic soda (density about 1·05), but the amalgamated zinc plate is placed in a smaller porous cell containing a concentrated solution of caustic soda, which is situated inside the first. The e. m. f. of the battery it at first 2·5 volts, and it is maintained above 2·4 volts for ten hours. The internal resistance is about 0·8 ohm, but varies, of course, with the thickness and material of the porous diaphragms. Employing 600 c. c. of the depolarizing liquid, 130 c. c. of weak soda solution, and 110 c. c. of the stronger solution, the intensity maintained was very near 0·423 ampere for an interposed resistance of 5 ohms and 0·22 ampere for a resistance of 10 ohms (Comptes Rendus, cxxi, 251).

Cycle Notes.

The lightest wheel is not always the fastest. Lack of rigidity will often tend to decrease the speed of a machine far more than the addition of a few pounds to its weight. Only machines of the highest grade can with safety be made very light, and even then a very light machine is only to be recommended to a careful and expert rider who will nurse it over rough roads and bad ones. Light wheels, even though they may not break down in one season's riding, will not last so long as heavier ones of the same quality, and are more easily damaged by falls. The minimum weight which can be safely ridden depends upon the character of the roads upon which it is to be used, as well as upon the weight and skill of the man who is to ride. Beginners will find safety and comfort, too, in selecting a wheel which weighs a few pounds more than the lightest. Too much weight is bad; too little weight is much worse.

The registered number of wheelmen in the city of Rochester, New York, is 13,500.

Bicycles are part of the equipment of many cruising yachts nowadays. They are utilized by the yachtsmen when ashore.

Bicyclists in the region round about St. Johns, Mich., have a queer but substantial grievance. The fields and farms thereabout are bounded and guarded with quickset hedges instead of by fences. At this time of year the farmers trim their hedges, and as a consequence the roads are strewn thickly with boughs full of briers, sharp slivers of tough wood, and short snippings of hedge points, which puncture bicycle tires.

Miss E. S. Hutchins, of Big Rapids, Mich., has devised a tire which consists principally of rubber, but is grooved to allow a heavy leather cord to encircle it and take the heaviest wear.

A citizen of Denver suggests that "inasmuch as it costs each bicycle rider $70 a year for a new wheel, let the bicyclers organize a bicycle factory, subscribing $100 each. Each wheel costs $20, the profit the factory would make would be $50 per annum on each wheel, and each of the shareholders would be sure to buy wheels. In this way the annual cost would be reduced from $70 to $20, and the latter amount to be distributed among our own people."

For twenty-five cents any English wheelman can telegraph the British weather bureau and receive a telegraphic reply giving the weather probabilities for any desired district.

The newest term for wheelwomen is "cyclestrienne."

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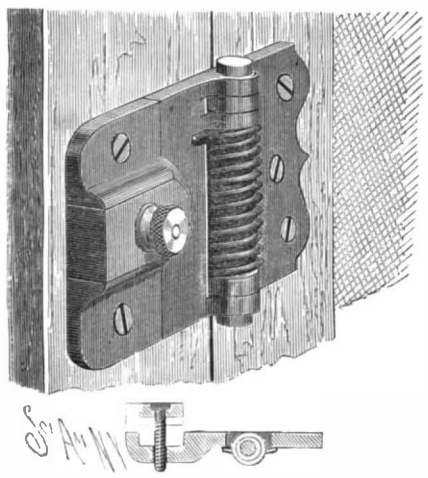
A DETACHABLE HINGE FOR SCREEN DOORS, ETC.

The illustration represents a simple and inexpensive form of hinge by means of which a door may be held in position and readily removed any number of times by simply unscrewing a nut, without the necessity of removing wood screws or other fastening devices inserted in the wood of the door casing. The improvement has been patented by Oliver H. P. G. Spencer, of Mount Carmel, Ill. The hinge is attached to the stile of a screen or other door, and is composed



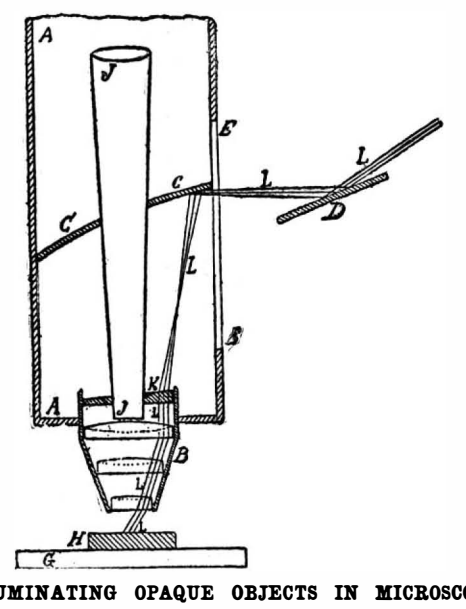
SPENCER'S DETACHABLE HINGE.

of two parts, connected by a pivot pin on which is coiled a spring. The outer leaf of the hinge has at its rear edge a central projection with transverse groove on its under side, as shown in the small figure, adapted to receive and fit over a reduced portion of a bracket plate attached to the casing or frame of the doorway. At the center of the reduced portion of the bracket plate is a bolt with a square head fitting in a recess in the back face of the bracket, while its free threaded end passes through an opening in the central projection of the outer leaf of the hinge, where it is engaged by a milled nut. To take down the door it is only necessary to unscrew the nut, the hinge remaining on the door and the small bracket plate on the casing, the nut being again placed on the bolt that it may not be lost.

MICROSCOPE FOR THE EXAMINATION OF OPAQUE OBJECTS.

Several attempts have been made up to the present time to devise apparatus for the illumination of opaque objects examined under the microscope. One of the best known processes is that of Lieberkuhn, which consists in applying around the objective an inclined concave mirror, which concentrates the luminous rays in reflecting them upon the preparation. This apparatus cannot be applied unless the frontal distance of the objective is sufficient to permit of the passage of the luminous rays sent obliquely. It can, therefore, be employed only for feeble magnifications. Moreover, such oblique illumination is an inconvenience.

Mr. Charles Fremont has succeeded in effecting the illumination through the interior of the tube of the



ILLUMINATING OPAQUE OBJECTS IN MICROSCOPE.

microscope and the objective, so that this new method is applicable to even the strongest magnifications.

The arrangement adopted, as described to the Academy of Sciences, through Mr. Marey, is as follows:

The pencil of light, L, directly projected or reflected by the mirror, D, enters the body, A, of the microscope tube through an aperture, E E, and meets a concave mirror, C, which is movable and capable of being raised or lowered in order to send the light through the lenses of the objective, B. A prism, K, is interposed in the path of the pencil in order to right it and render it parallel with the axis of the microscope before it enters the objective.

The mirror, C, and the prism, K, are provided with an aperture to permit of the passage of a conical tube, J, that allows one to perceive, through the ocular, the image of the preparation, H, given by the objective, B, so that such image is never met by the luminous pencil.

This process permits of obtaining a vertical illumination of great intensity and of perfect clearness, both qualities indispensable for photographing microscopic images.

In presenting this apparatus to the academy, in behalf of Mr. Fremont, Mr. Marey recalled the experiments that he had made toward reproducing microscopic beings by chronophotography. With ordinary illumination, the objects detach themselves from a luminous ground, and successive photographs of them can be taken only upon a movable film. The series of images thus obtained include, it is true, all the data necessary for determining the changes of form and position of the object in motion; but, in order to appreciate such changes, it requires considerable labor in the way of comparing the images, which are intimately connected in a long series. For such studies it would be preferable to have recourse to chronophotography upon a dark ground, which, upon the same immovable plate, reunites the successive images of the object.

This method, which has been applicable only to objects of large dimensions, will, perhaps, owing to Mr. Fremont's new instrument, be applicable to microscopic photography. Should such be the case, a great progress will certainly be made in our knowledge of the motions of microscopic beings.

Living Greek—the Language of Physicians and Scholars.

At a recent meeting of the New York County Medical Association, Dr. Achilles Rose read the paper. Since the establishment of the American school at Athens, founded in 1892 by the American Archæological Institute, supported by contributions from eighteen universities in the United States, there had been a diffusion among cultivated people of a more correct notion of the Greek language, and of the fact that it was a living language. It was generally conceded that a study of the classical languages, and of the Greek especially, was a powerful means of elevating and ennobling the mind and character, and could not be dispensed with. The Greek language was practical as well as ideal. It was easy to learn as a living language, but it was necessary to reform methods of teaching it in the colleges. It was remarkable how it had been calumniated, by claiming that, as spoken by the Greeks to-day, it was mixed with various other languages. As a matter of fact, it had been preserved remarkably pure from ancient times, and for this we were much indebted to the Greek Church. As an example of the ease with which Greek could be learned as a living language, Dr. Rose presented his little daughter, about seven years of age, who recited a piece and sang in Greek. She also spoke a piece in French, showing that during childhood the learning of languages was easy.

Dr. Fred C. Valentine thought it would prove far more practical to make Spanish the language of physicians and scholars, for it was already spoken by eighty millions of people, was beautiful, its orthography was phonetic, with few exceptions, and one could learn to speak it in as many weeks as were required to learn the Greek alphabet.

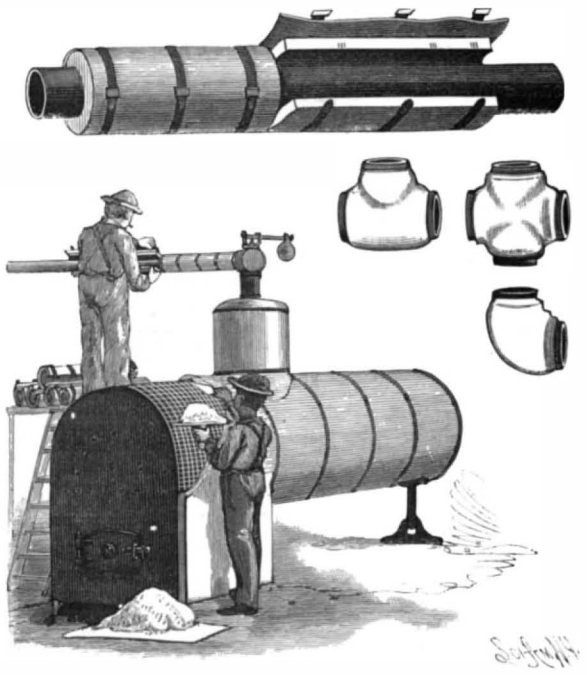
The president had come to the conclusion that the preponderance of evidence was in favor of Greek as the language of scholars, for it was a language of very great beauty, of very great flexibility, and one possessing the power to carry ideas to others as perhaps no other language could.—Medical Record.

Guttapercha Leaves.

A new enterprise that it is claimed will largely increase the output of guttapercha is the collection and export of the dried leaves of the gutta tree. At first a few small packages of leaves were forwarded to Paris, and, once there, an excellent quality of pure guttapercha was extracted, the leaves yielding from seven to ten per cent of their weight of the manufactured article. Mons. F. Hourant, who sent the leaves to France, after some difficulty, succeeded in getting the natives to work systematically at the collection of the leaves, and now they are being exported in quantities which increase from month to month. He has erected a factory at Kuching for the purpose of thoroughly drying these leaves before shipment. The advantages of this method are evident. The natives formerly cut down a tree to obtain the sap, and from this, if it were an adult tree twenty-five to thirty years of age, there was obtained one catty of pure dry gutta. Fully as much can be obtained from two pluckings of the leaves of the same tree, without injuring it, for it will long continue to put out fresh foliage and, what is more important, will live to seed and reproduce its species. This is an important point, as the best gutta trees do not bear fruit until thirty years of age. The gutta obtained from the leaves is also pure and dry, which is much more than can be said of the ordinary Dyak gutta. The millions of trees that have already been destroyed by the native gatherers are also still of service, as their stumps have sent out numerous small shoots, and, though these are too small to be tapped, their leaves are as good as those of the adult tree.

STEAM PIPE AND BOILER COVERING.

The saving of coal effected by having steam boilers and pipes thoroughly covered is well understood by nearly all steam users, and the absolute necessity for such covering of pipes where live steam is to be conveyed any considerable distance is everywhere conceded. In the accompanying illustrations are shown the methods by which non-conductive covering is applied for purposes of insulation by the New York Fireproof Covering Company, of 121 Liberty Street, New York. The material used as a non-conductor is rock wool, which is made of feldspar and limestone, in much the same way as mineral wool, and is claimed to be superior to the latter, inasmuch as it contains no sulphur, presenting more minutely divided air spaces, whereby the covering is made very light, containing about 96 per cent dead air. The pipe covering is made in sections three feet long, to fit any size pipe, with heavy canvas casing and laps and metal bands and fittings to match. For boilers, domes, heaters, tanks, etc., the coverings are made in blocks from one to two inches thick, these to be covered with wire netting and a coating of rock wool cement, making a smooth, hard finish, the blocks being cut to fit around projecting pipes or other irregularities. A rock wool fireproof cement, which can be mixed with a trowel and applied like mortar, is provided for covering irregular shaped surfaces. The covering is in each case



STEAM PIPE AND BOILER COVERING.

very simple of application, requiring no skilled labor: and as the saving from radiation is very great, the investment would pay for itself in a few months' time.

Oriole Strawberry.

As an example of plant breeding on scientific principles, Mr. A. W. Slaymaker writes to the Rural New Yorker of the Oriole strawberry. The blossoms of Bubach, a pistillate variety of vigor and productiveness, were fertilized with pollen from the Hoffman, an early Southern variety, with vigorous habit and fine fruit which lacks size. The seeds from this cross were planted and two new varieties have been selected, one named Oriole and the other Ideal. Oriole has all the most desirable characteristics of the Bubach and an extra early ripening season, and in this way it combines the good qualities of both berries. It should be said that all the blossoms of the Bubach parent plant, except those which were fertilized with the Southern sort, were taken off and the runners removed the year before, so as to give the fruit originating from the cross all possible vigor.

The Japanese Plum.

Mr. J. H. Hale is satisfied that the Japan plum in Georgia will form a more profitable market fruit even than peaches. The trees are strong growers and come into bearing a year after planting; in two years they yield half a bushel each, and more, of course, as they grow older. The fruit, as grown in Georgia, is very large and brilliantly colored, and has a tough skin that makes it easy to ship. Such varieties as the Burbank, for example, if picked while green, but fully grown, and wrapped in paper, can be carried for two or three weeks and will yet ripen into a rich, sweet fruit with fine color. The season of shipping ranges through June and early July. The Willard ripens about May 20, the Abundance from June 10 to June 15, and the Burbank some ten days later.

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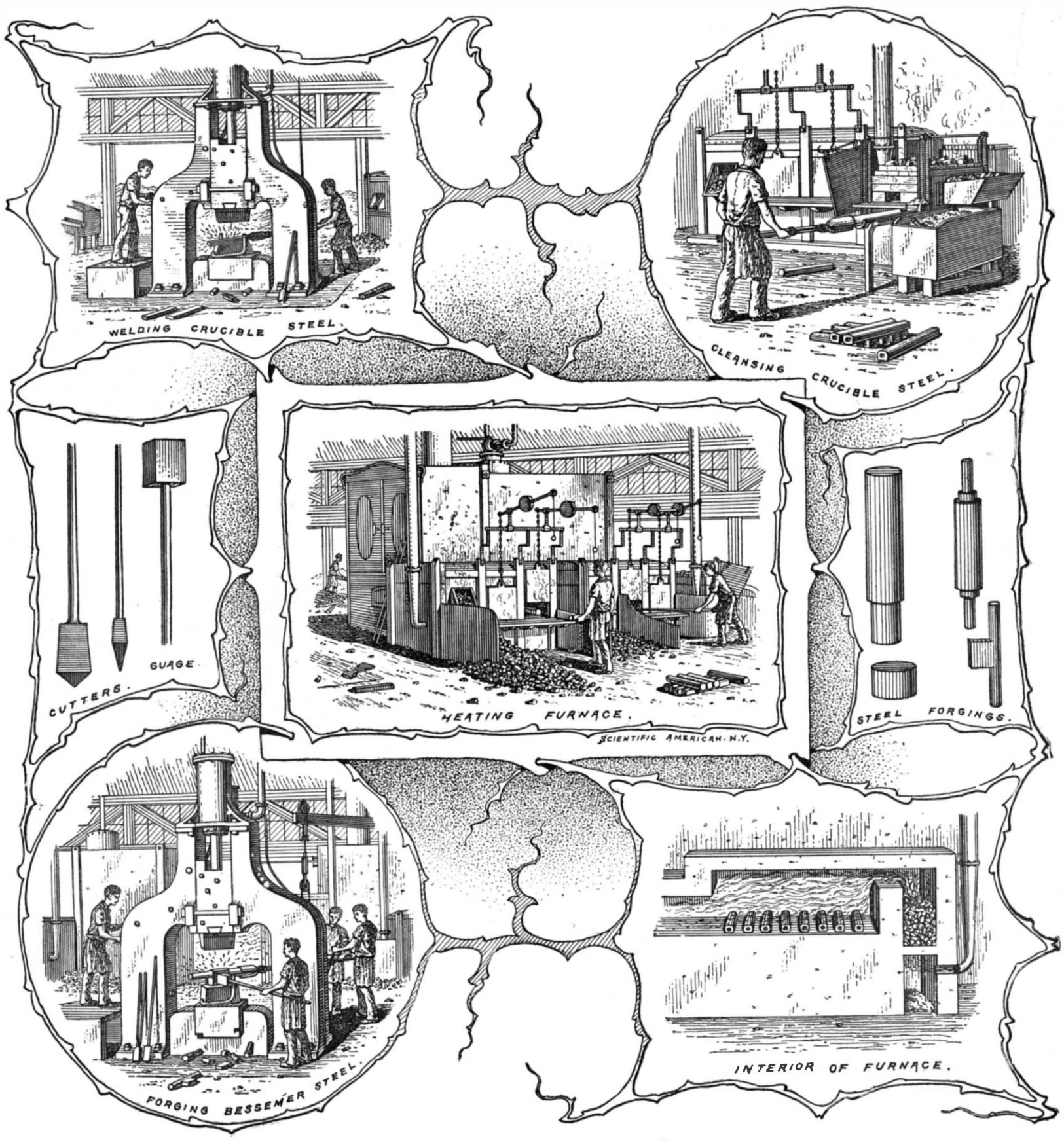
WELDING AND FORGING STEEL.

The illustrations accompanying this subject were taken from the plant of the Benjamin Atha and Illingworth Company, Harrison, N. J. Crucible or tool steel is used principally for manufacturing tools requiring strength and elasticity, such as agricultural implements, machinist tools, etc. Certain grades of steel are first melted up and run into billets weighing about 75 pounds each. They are about 24 inches in length and about 3½ inches in height and width. The billets or ingots to the number of eight are placed in a furnace about 3 or 4 inches apart and left to heat about a half hour. The interior of the furnace is about 6 × 8 feet in length and width, and is about 2 feet in height and lined with fire brick. Soft coal is used for heating, the flames of which are blown through and heated for about ten minutes, bringing the color up to a bright red.

They are then taken out one at a time and placed into a retort heated by a coke fire for about two minutes. The interior of the retort is about twelve inches in width, about twelve inches in height and about four feet in length. They are then drawn out and the scale scraped off by the operator drawing the ingot back and forth across the sharp edge of the iron shelf in front of the mouth of the retort. The ingot is then drawn back and forth into a trough filled with a composition of plaster of Paris and borax, the red hot billet causing the composition to melt and enter the cracks and seams, cleaning out the dirt and grit. The billet is then placed on the steel die of the welding apparatus and hammered down into a perfect solid bar, hammer. The apparatus for forging is similar in shape to the welding machine. The hammer or slide is about two feet in width, about three feet in length and about one foot in thickness.

The striking part of the hammer is made of steel, and is locked securely to the bottom of the ram or slide. The striking and stationary die each weigh about 225 lb. They are about 18 inches in length, about 8 inches in width, and about 8 inches in height, both being placed in an oblique position. The cylinder is about 4 feet in length and about 18 inches in diameter. The hammer makes a 2 foot 8 inch stroke, and is worked by means of levers in the same manner as the welding machine, about 60 to 70 lb. of steam being used to run the apparatus. As soon as the bar has been heated up to the right color it is taken out



THE TOOL STEEL INDUSTRY.

across the billets by means of a blast pipe connected to the sides of the furnace, the air passing up underneath and through the fire box. After the material has been heated to a cherry red color, it is taken out and hammered down so as to fit certain sized tongs. The jaws or clasping end of the tongs are scoopshaped, fitting around and holding the ends of the billets securely when being hammered. The welding hammer is worked by steam and weighs about 3,500 pounds. The hammer is raised and lowered by means of an upright steam cylinder connected to the top of the machine, the piston rod of which connects with the top of the hammer. The hammer makes a stroke of about 2 feet 8 inches. The operator who regulates the stroke of the hammer by means of levers can give the billet a light or a heavy blow, the light blow being given by means of a shut-off lever. After the first heating, the ingots are placed in another furnace and the right shape and thickness for the rolling mill, which in turn presses it out into round, square or flat bars of steel. If the billets are left in the furnace too long, they will break into small pieces as soon as the hammer touches them. Three hands can weld nine heats of eight bars each daily. Forgings are made of soft Bessemer steel. They consist principally of piston rods, shafting, pinion blocks, eccentric cranks, connecting rods, planer heads, cranks, different parts of engines, etc. They are forged out in a rough state and sent to machine to be turned down into the proper shapes and sizes. The soft steel comes in the form of billets and is first heated and beaten out flat or square, according to the size of the forging wanted, with a steam hammer weighing about from three to five tons. The bars of steel are then sent to be forged into shape. They are first heated in a fire brick furnace to a bright red heat and then placed under the by means of a pair of tongs and a derrick, and placed in position under the hammer. To forge it down to the right width and thickness an attendant places a squaring tool or gage against the bar, holding it in place until the hammer strikes it. For cutting into the heated steel where a section is to be rounded off a V tool is used, the cut being made by dropping the hammer on the tool. The section is then rounded off by the operators turning the bar slowly around and tapping the metal with heavy and light strokes of the hammer. Four hands are required at the forging hammer, two for turning the metal on the die, one for cutting and gaging, and one for operating the hammer. Some forgings weigh as high as 2,800 lb.

THE authorities of Boston University have decided that the students must either give up the use of tobacco or leave the institution.

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Another Large Telescope.

At the modest shop of the Clarks in Cambridge, Mass., the lenses of the great forty inch telescope for the Yerkes Observatory of the University of Chicago lie practically finished, and await only the final tests of the committee of inspection for their acceptance. These will probably be made in two or three weeks. The mounting of the telescope, however, will probably not be completed until spring, for the construction and equipment of so large an instrument is really a matter requiring much time. So far as the lenses are concerned, Mr. Clark considers them superior in definition and figure to any of the comparable glasses which have been made by the firm.

The largest work now in hand here is the new Percival Lowell telescope. It will be remembered that on his return from Arizona, Mr. Lowell was so well pleased with the results obtained that he at once expressed an intention to observe Mars during the opposition of 1896 with a large telescope and from the very best site discoverable. He at once ordered a telescope from the Clarks and sent an astronomer around the world to select the place for the observatory.

The telescope is to be of twenty-four inches aperture, a truly large glass, even as compared with the monsters which modern opticians have been able to construct, and an order was at once placed with Mantois, of Paris, for the disks of glass, which were to have been delivered early in August. They are now here a month late, and this lateness means a little more expedition on the part of the lens shapers, since the completed telescope must be ready for Mr. Lowell at a given date in June of next year. An examination of the plates of glass shows them to be of the finest quality, and in the opinion of the experts in the shop in Cambridge have never been excelled by any of the disks which have been received there.

The flint glass has already received its rough grinding and takes on something of the shape which it will have when completed, but there are many refinements and very large requirements in point of time and attention before it can even be tested as a lens, beyond which time there are all the necessities of delicate final correction. In the forming of these lenses some departures will be made from the regular methods which have heretofore been employed, notable among which will be the substitution of glass forms for the metal ones which have been customarily in use for the earlier processes.

For this telescope the Clarks are themselves constructing the mountings which, aside from the pier, will weigh some tons. The material for the pier will depend in some measure upon the site selected, for if this should be in some desert, where stone is not available, a steel pier will be taken from Cambridge. The question of site is still undetermined, reports in the newspapers to the contrary notwithstanding, and Mr. Douglass is still abroad in search of a perfect atmosphere.

Trees and Insects in Central America.

In Mr. Richard Harding Davis' account of the travels of "Three Gringoes," he thus narrates, in Harper's for September, some of his experiences:

"At every hundred yards or so there were giant trees with smooth gray trunks, as even and regular as marble, and with roots like flying buttresses, a foot in thickness, and reaching from ten to fifteen feet up from the ground. If these flanges had been covered over, a man on muleback could have taken refuge between them. Some of the trunks of these trees were covered with intricate lacework of a parasite which twisted in and out, and which looked as though thousands of snakes were crawling over the white surface of the tree; they were so much like snakes that one passed beneath them with an uneasy shrug. Hundreds of orchids clung to the branches of the trees, and from these stouter limbs to the more pliable branches of the palms below white-faced monkeys sprang and swung from tree to tree, running along the branches until they bent with the weight like a trout rod, and sprang upright again with a sweep and rush as the monkeys leaped off chattering into the depths of the forest. We rode through this enchanted wilderness of wavering sunlight and damp green shadows for the greater part of the day, and came out finally into a broad open plain, cut up by little bubbling streams, flashing brilliantly in the sun. It was like an awakening from a strange and beautiful nightmare."

INSECTS.

"I have camped in our West, where all you need is a blanket to lie upon and another to wrap around you, and a saddle for a pillow, and where, with a smouldering fire at your feet, you can sleep without thought of insects. But there is nothing green that grows in Honduras that is not saturated and alive with bugs, and all manner of things that creep and crawl and sting and bite. It transcends mere discomfort; it is an absolute curse to the country, and to every one in it, and it would be as absurd to write of Honduras without dwelling on the insects as of the west coast of Africa without speaking of the fever. You cannot sit on the grass or on a fallen tree, or walk under an upright one or through the bushes, without hundreds of some sort of animal or other attaching themselves to your clothing or to your person. And if you get down from your mule to take a shot at something in the bushes and walk but twenty feet into them, you have to be beaten with brushes and rods when you come out again as vigorously as though you were a dusty carpet. There will be sometimes as many as a hundred insects under one leaf; and after they have once laid their claws upon you, your life is a mockery and you feel at night as though you were sleeping in a bed with red pepper. The mules have even a harder time of it; for, as if they did not suffer enough in the day, they are in constant danger at night from vampires, which fasten themselves to the neck and suck out the blood, leaving them so weak that often when we came to saddle them in the morning they would stagger and almost fall. Sometimes the side of their head and shoulders would be wet with their own blood."

Some Remarkable Trees in England and Abroad.

England, in common with other wooded parts of the civilized universe, possesses many ancient and historical trees, and though the question of age may often be a matter of blind faith, on the contrary the history is a matter of dry facts. Until the middle of the last century the natives of the New Forest pointed out the very tree under which King Rufus fell, an alder growing in a swampy spot beneath which, we read, the grass "squelched when the Red King fell." "Rollo's oak," which, according to legend, is that on which Rollo hung bracelets as a challenge, is just now causing the good people of Rouen great uneasiness because of its dilapidated condition, albeit it still flourishes on top—the spot, by the way, whereat old age first tells its tale.

In the East, historic trees are usually associated with the names of saints, one of the most famous of these being the Bo tree at Anuradhapura, in Ceylon, which has none in the world to compare with it. Its age is a matter of record, its conservancy has been an object of solicitude to successive dynasties, and the story of its vicissitudes has been preserved in a continuous series of chronicles among the most authentic which have been handed down to mankind; and its green old age would seem almost to verify the prophecy given when it was planted—that it would flourish for ever. We have a contemporary report of the planting of this tree with grand ceremonies in 245 B.C.—a period of 2,140 years since—and it is still flourishing. There are other notable Bo trees, among other places at Benares, and it was from a shoot from this tree that that at Ceylon has grown.

Quitting the East for the nonce, we would notice some ancient historical trees which are to be met with in this country, some of the most celebrated being found in Sherwood Forest and in the surrounding domains of the Duke of Portland. One of these is the Major oak in Sherwood Forest, which giant is hollow; and although the entrance is only about wide enough to allow of a man passing through, there is room inside for twenty persons. The girth of this Major oak is 54 feet outside the root, 34 feet above the root, 25 feet five feet above the ground, and the mean girth is 38 feet 4 inches. The spread of foliage is magnificent. Another famous tree is the Greendale oak, which stands near the lawn of Welbeck Abbey, and in its prime must have been a tree of enormous magnitude. It is now, however, in a very bad state, its worn old limbs being held up by means of chains. The gap in its trunk was originally so wide that a former Duke of Portland drove a four-in-hand through it for a wager. Another tree, or rather trees, to be found in Sherwood Forest is known as the Butcher's Shambles, being a group of trees on the boughs of which Robin Hood and his merry men were wont, if tradition is to be believed, to hang their venison. In the same neighborhood also is another tree associated with the legends of the light-hearted outlaw, the Robin oak, a grand tree in its time, but now hollow, though hale.

Leaving England and returning to the East, we may note the Verbudda banyan, which is called Cubberbeer by the natives. This tree is believed to date from the second century of the Christian era, and in the neighborhood stood a banyan, which Heraclius, Alexander's admiral, described as big enough to shelter an army. This Cubberbeer answers to the description of Heraclius even now, the principal stems, numbering four hundred, inclosing an area 2,000 feet in circumference, the small stems outside having been estimated at 3,000. Tradition asserts that when some army passed by, 7,000 men were encamped beneath it. At the beginning of the present century the Rajah of the district used to make the tree his headquarters, lodging suite and guards, carriages, elephants, cattle and followers beneath it.

Sir Samuel Baker tells of some olive trees in Cyprus which must be very old, as they grow slowly. In Provence there are some planted over 200 years since, and these are not more than 15 inches thick. At Dali, however, there is one, the trunk of which is 29 feet in girth, that is still sound. Until 1871 Teneriffe had a tree of vast antiquity and sad interest. When the island was discovered the inhabitants used to worship a dragon tree at Orotava, which was so old that it is reputed to have played some part in the Creation. This was in 1402. Humboldt measured the tree in 1799, and found the girth 45 feet, and at ten feet above the ground 36 feet, the height being only 65 feet. The tree was, however, blown down in 1871.

At Materea, by Heliopolis, is a sycamore which for over 1,000 years has been known as the "Virgin's tree," and still flourishes.

In the Old World the greatest tree is the African Baobab, and in the New World the Wellingtonia. At the mouth of the Senegal River specimens of the Baobab have been measured of over 100 feet in circumference, though it is never more than 60 feet in height, and becomes hollow at an early age. Dr. Livingston found one in which thirty men could sleep comfortably, and Humboldt tells of one in Senegambia wherein the negroes held their meetings. Adamson has calculated that some of these trees must be at least 5,000 years of age, by which time they are 30 feet in diameter. Among curiosities there is the bottle tree of Brazil, which swells from a slender base until, at half its height, the diameter is equal to the altitude, a similar genus being found in tropical Australia. We cannot close these lines without a reference to the so-called "living stones" of the Falkland Islands, where, owing to the strong polar wind, it is impossible for trees to grow erect, so Nature has made amends by furnishing a supply of wood in the most curious shape imaginable. Here and there are to be found in the islands singular shaped blocks of what appear to be weather beaten and moss-covered bowlders in various sizes. These bowlders cannot be turned over, they being tied to the earth by roots of extraordinary strength. No other country in the world has such a peculiar forest growth, and it is impossible to work these odd-shaped blocks into fuel, because the wood is perfectly devoid of grain, and appears to be nothing but a twisted mat of fibers. The above constitute a few of the remarkable trees of the world.—Wm. Norman Brown in the Gardeners' Magazine.

Paris Green.

It is estimated that more than two thousand tons of Paris green are annually used as an insecticide in the United States, since it is the most rapid and effective of the arsenical preparations used for this purpose. The chief difficulty in using it is the readiness with which it settles to the bottom of the tank of spraying apparatus. This is because it is less finely divided than London purple—a point in which the latter compound has a certain advantage. In the last number of Insect Life Dr. C. L. Marlatt explains that there is no reason for this coarseness of grain in Paris green, except that the market has demanded a dark colored article, and the darker color is due to the larger size of the crystals. Paris green would be much more satisfactory as an insecticide if it were reduced to a fine powder, but it would then lose its intensity of color and become whitish, which, in popular estimation, would indicate adulteration. The fact is that the manufacturer who for years controlled the market did so because he had discovered a method of crystallizing the product in unusually large particles, which were, therefore, very deeply colored. Of course, it was less valuable in this form, and yet the dark green large-sized crystals were more difficult to manufacture and more expensive, and the country went on using this for years, although a more effective poison could have been made for less money. In testing Paris green when reduced to fine powder, Dr. Marlatt found that it remained in suspension three times as long as the ordinary product did, while, undoubtedly, the fineness in division made it more effective against insects. The last step in the process of manufacturing Paris green is the combination with acetic acid. When, however, this acid is omitted, an impalpable powder, instead of a crystalline product, is secured, and this will remain in suspension almost perfectly for many hours. Experiments are now in progress to ascertain whether this can be used as a substitute for Paris green, to which it is so superior in fineness, while it costs only half as much.

Good Counsel.

Young men of an inventive turn of mind should be constantly on the alert, observant in everything. Note where a saving of time or material can be effected by improved methods. If you cannot make two blades of grass grow in the place of one, invent some method to do certain things quicker and better than by present methods. Time is money, and any method by which time is saved has a commercial value. If the operation is performed better and quicker, the commercial value of the method or means enhances accordingly. The simplest inventions are of the most value, comparatively. A recent report from the Patent Office states that the majority of successful patents were for articles that retailed for one dollar or less.—Rural Mechanic.

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Correspondence.

Gases as Germicides and Disinfectants.

To the Editor of the SCIENTIFIC AMERICAN:

In "Science Notes" of SCIENTIFIC AMERICAN for September 21 is a report of the observations of M. Pictet on the use of a mixture of sulphurous and carbonic acid gases as a disinfectant and an extract from Prof. D'Arsonval's report to the Société de Biologie on the great value as a germicide of this mixture, which he has named "Pictet's gas," and which he says forms a chemical combination.

For the past year I have been conducting a series of experiments with many different mixtures of CO_2 and SO_2, and also of different mixtures of carbonic and sulphurous acid gases, H_2CO_3 and H_2SO_3, under varying hygrometric conditions and of temperature and pressure. These experiments are as yet incomplete, owing to a lack of the necessary chemical and physical apparatus and pathogenic bacteria. As soon as the work is completed the results will be published. So far, I have come to the following conclusions:

1. That the gases are a simple mixture with their derivatives.

2. That in certain proportions the mixed gases have more penetrating power and quick germicidal action than either gas alone under any circumstances tried.

The gases act as germicides, and, therefore, as disinfectants:

1. By altering the specific gravity of the medium, i. e., air.

2. By absorbing moisture from the germ, or by entering in solution with it, forming H_2SO_3 and H_2CO_3, appropriating the hydrogen and liberating the oxygen to reunite or be nascent.

3. By the method of producing and mixing the gases evolving nascent oxygen and hydrogen in the process of disinfection and the liability of forming CS_2 and SH_2, and thus, perhaps, liberating H_2O_2.

4. Removing oxgen (i. e., air) from aerobic bacteria.

5. That the gas, or gases, act with more effectiveness when previously passed through water or moisture.

6. That the possibility of the nitrogen present entering the combination when chemical change takes place and aiding in the process must not be overlooked.

JOSEPH BUFORD GRAHAM, M.D.

Savannah Quarantine Station, September 24, 1895.

Some of the Uses of Shells.

Among the various contributions that nature makes to the wants of man, shells figure quite extensively. As vessels for food and drink and other domestic purposes, many species are very conveniently shaped. The valves of many species of clams are large and deep and available for cups and dishes, and as such have been used by the American Indians, who have also employed them as knives, scrapers and hoes. Shells of the genus Unio have always held an important place in the domestic and mechanical arts of the savages of North America. The valves of many varieties of these shells are well adapted to the use of man. Although not large enough for food vessels, they make very satisfactory spoons and cups; but it is probable that they were much more frequently used by the Indians as knives and scrapers. The very widely distributed Pectens, on account of their beauty of form and color, have been in great favor with all peoples. They were extensively employed by the ancient inhabitants of America as ornaments and rattles, and many specimens obtained from graves and mounds appear to have been used as utensils, paint cups and vessels for food and drink.

The Haliotis affords an excellent example of the varied uses to which the natural shell has been applied by savage peoples. Explorations of the burial places of the ancient tribes of the Pacific coast have brought to light numerous specimens of these shells, which had apparently served as bowls, dishes and spoons. This shell probably formed as important a factor in the commerce of these tribes as did the large conches of the Atlantic coast in that of the mound builders and their neighbors. The rougher and more homely oyster shell enjoyed the favor of the mound-building tribes, and probably served many useful purposes. Many species of the Fissurella and Dentatium shells were in common use, advantage being taken of the natural perforations for stringing, the latter being quite extensively used for money on the Pacific coast.

A great variety of the larger univalve sea shells have been used in the unaltered state, the Busycons probably taking the most important place, and species of the Strombus, the Cassis, the Nautilus, and Fasciolaria following in about the order named. The Busycon perversum has been more extensively employed than any other shell, and the uses to which it was put by the ancient Americans were numerous and varied. Fine specimens of vessels made of this shell are on exhibition in the National Museum at Washington. As domestic utensils, bivalve shells have held a place hardly inferior in importance to that of the large univalves. Marine and fluviatile varieties have been used indiscriminately, and generally in the natural state; but occasionally altered by art to enhance their beauty or add to their convenience. Such alteration consisted chiefly in the carving out of a kind of handle to form a spoon. It is a curious fact that most of such utensils that have been met with have been made from the left valve of the shell, which gives such a position to the handle that they were most conveniently used by the right hand, thus indicating righthandedness on the part of their manufacturers and users.

According to Pictet, large shells called tritons were used in ancient times as vessels for offering libations with.

Rondelet, speaking of the Olearia, says that the goldsmiths make very elegant ewers of this shell by adding a foot and handle to it, and that some regard these vessels as a preservative against poisons.

In the cottages of Shetland, the Fusus antiquus is suspended horizontally and used as a lamp, the oil being placed in the cavity of the shell and the wick passing through the canal.

Patellæ, in the vicinity of Cancale, serve as an oil reservoir in small lamps called "crassets."

The common mussel and a few other shells are called artists' shells, from artists' colors being put in them.

Saint James shells, a species of Pecten, are frequently used in Brittany as milk ladles and drinking vessels.

According to Pliny, the round cockles were used for measuring oil.

In China, certain Tridacnæ are used as watering troughs for cattle, and some of the wealthy mandarins possess baths made of a species of this shell. A pair of valves of T. gigas, weighing upward of 500 pounds and measuring about two feet across, are used as holy water basins in the church of St. Sulpice, Paris. They were obtained from Francis I, to whom they had been sent by the Republic of Venice.

In several countries of the Indies the windows are glazed with transparent shells cut into squares. The species used for this purpose is Placuna vitrea, or "window shell." All the churches of Goa still have their windows glazed with this shell. De Guignes states that the same use of the Placuna is made in China.

We meet with numerous examples of the use of shells as instruments of war, hunting, labor, and construction. Drake tells us that some of the South American tribes had hatchets and knives made of shells that often reached a foot in length. These were carved and polished with art, and must have lasted a long time.

In New Caledonia, flat axes are made of shells of large size and round form.

The shells of the genus Tridacna are quite thick, but their edge is thin enough to allow the Polynesians to make picks, axes, and other instruments of the kind out of them. The Indians of Florida made their tomahawks out of the shell of Busycon perversum.

Among the Fuegians, the only native tool is a large shell of a sea mussel, carved and sharpened and firmly affixed by a seal skin strap to a stone designed to be held in the hand.

The Indians of Vancouver's Island still carve their wooden sepulchral images with knives made of shells.

Celts made of Strombus and Busycon shells have been found in various parts of America. These are polished like the similar instruments made of stone. These implements are frequently mentioned by early writers. Wood, speaking of the Indians of New England, says that their canoes were made of pine trees, which, before they were acquainted with English tools, they burned hollow and scraped smooth with clam and oyster shells. The great majority of scraping implements obtained from the mounds, graves, and shell heaps of the Indians are simply valves of Unio or clam shells, unaltered except by use.

The first explorers of the Atlantic coast found many of the tribes tilling the soil with unworked shells lashed to rude handles, the shell most frequently used being that of the clam.

The use of shell in the manufacture of fishing implements seems to have been almost unknown on the Atlantic coast, but hooks of shell are very plentiful in the burial places of the Pacific coast, and are frequently so well shaped as to excite admiration.

Among the Caradjis of Australia, and several other peoples, a sharp shell is used for tattooing.

The Indian chief Powhatan tortured his enemies with the shell of a mollusk, and his wives made use of the same kind of implement for cutting their hair.

The Indians of Florida used the shell of the Busycon as a club head in the manufacture of their casse-tetes.

A rather novel use of shells by the Indians is mentioned by early writers. The two valves of the small mussels or clams were made to do service as tweezers for pulling out hair.

The spiral column of certain univalve shells was used by the Indians for making pins. Some of these were pointed at both ends, while others had heads like the pins of civilized people. The exact uses to which these objects were applied are unknown. The favorite idea of archæologists seems to be that they were hairpins, used by the savages to dress and ornament their hair.

Shells were largely used by the American Indians for the manufacture of articles of personal adornment, such as beads and gorgets, and for money.

The Friendly Islander wears the orange cowry as a mark of chieftainship. Another cowry is used by the Asiatic islanders to adorn their dress, to weight their fishing nets, and as a medium for barter. The New Zealander polishes the Elenchus into an ornament more brilliant than the pearl eardrops of classical or modern times.

Shells, especially of the large species of Buccinum, have been quite frequently used as musical or calling instruments. In antiquity, the name of the war trumpet was that of the Buccinum, which had been used from the remotest times.

The Polynesians use a sort of marine trumpet made of the shell of a huge mussel.

The Corsican mountaineers, in their wars with the Genevese, used a marine shell as a horn. On all the islands of the Pacific the Triton is the conch blown as the signal of war. The lambis, a sort of large snail of the American sea, serves as a hunting horn to several savage nations.

Throughout Provence, principally during harvest time, horns made of Buccinum undatum are used for calling the laborers to work and also for corresponding to great distances by means of sounds previously agreed upon. Upon the seacoast of Upper Brittany large whelk shells are used for the same purpose.

Shells were among the number of musical instruments of the Peruvians. They were also used by the Mexican priests in their religious ceremonies.

The chank shell (Turbinella pyrum) is carved by the Cingalese, and several varieties of it, from which the priests administer medicine, are held sacred.

The valves of Anodonta cecula are used as skimmers in Brazil, and the shells of an Ampullaria serve to dip up caoutchouc gum.

The mussel shell has a few applications. When polished, it is made into needle books, scent bottle holders, earrings, pincushions, etc.

Some of the cockle shells are made into pincushions, and the shell-flower maker uses them to form the hop and other imitations. Common, cheap pincushions are made of the whelk and many other shells.

Large quantities of small shells enter into trade use for making shell flowers and different articles of shellwork.

The shells chiefly used for imitation flowers are parts of the valves of barnacles, Dentalium, Oliva, Morginella, Strigella, Pholas, Cardium, etc.

Of late, among the curious uses to which the Turbo and some other shells have been put in Europe is for pipe bowls.

The shell of a species of Mitra is used for the same purpose by the inhabitants of the Banshee group.

The shell of the pearly nautilus is made into a drinking cup by the inhabitants of the East, and that of the N. pompilius is often mounted on a stand in Europe and used for holding flowers.

The shell of an Anodonta is used for the bridge of musical instruments by the Mittoo tribe in Africa, and round fragments of the shell are used by them for gambling purposes.

In Japan, the ladies play a game with the valves of shells with designs painted upon them.

The "green snail" of the dealers (Turbo olearius) is very largely used for ornamental purposes. Slices of the shell ground down to a thin surface are employed for inlaying various articles. Buttons, earrings, and other objects are made of it, and also very pretty ornamental stands that open with a spring and inclose scent bottles, etc. Of late years handsome sections obtained from this shell have been largely used for ornamental buckles for hats, shoes, and belts.

Fine, large shells of this species formed the drinking goblets of the Scandinavian monarchs, and are often still met with, very elegantly mounted and set in jewels.

Another shell of this genus, the Turk's cap, from the west coast of Africa, is used for making small articles, such as caskets, scent bottle holders, brooches, etc.

Invention of the Electro-magnetic Telegraph.

An interesting series of papers upon the history of the telegraph, by Mr. A. M. Tanner, published in the Electrical World, concludes as follows: "As early as the year 1837 the French Academy of Sciences had a permanent commission on electric telegraphs, composed of Arago, Becquerel and Savary. None of these distinguished savants ever questioned the claim of Morse to being the inventor of the electro-magnetic telegraph, and whatever may be said as to the date when the alphabetical code was first thought of, it is clear that there is no published nor acceptable proof that any one but Morse invented it. An unbiased or impartial opinion based on proof is that the essential features of the modern electro-magnetic telegraph—viz, the electro-magnet, the armature with its retracting spring, transmitting signals by a finger key, and reading them by sound—were invented or proposed by Morse in the year 1838, and made known to the public at that time. Therefore, let Morse forever be considered the father of the electro-magnetic telegraph."

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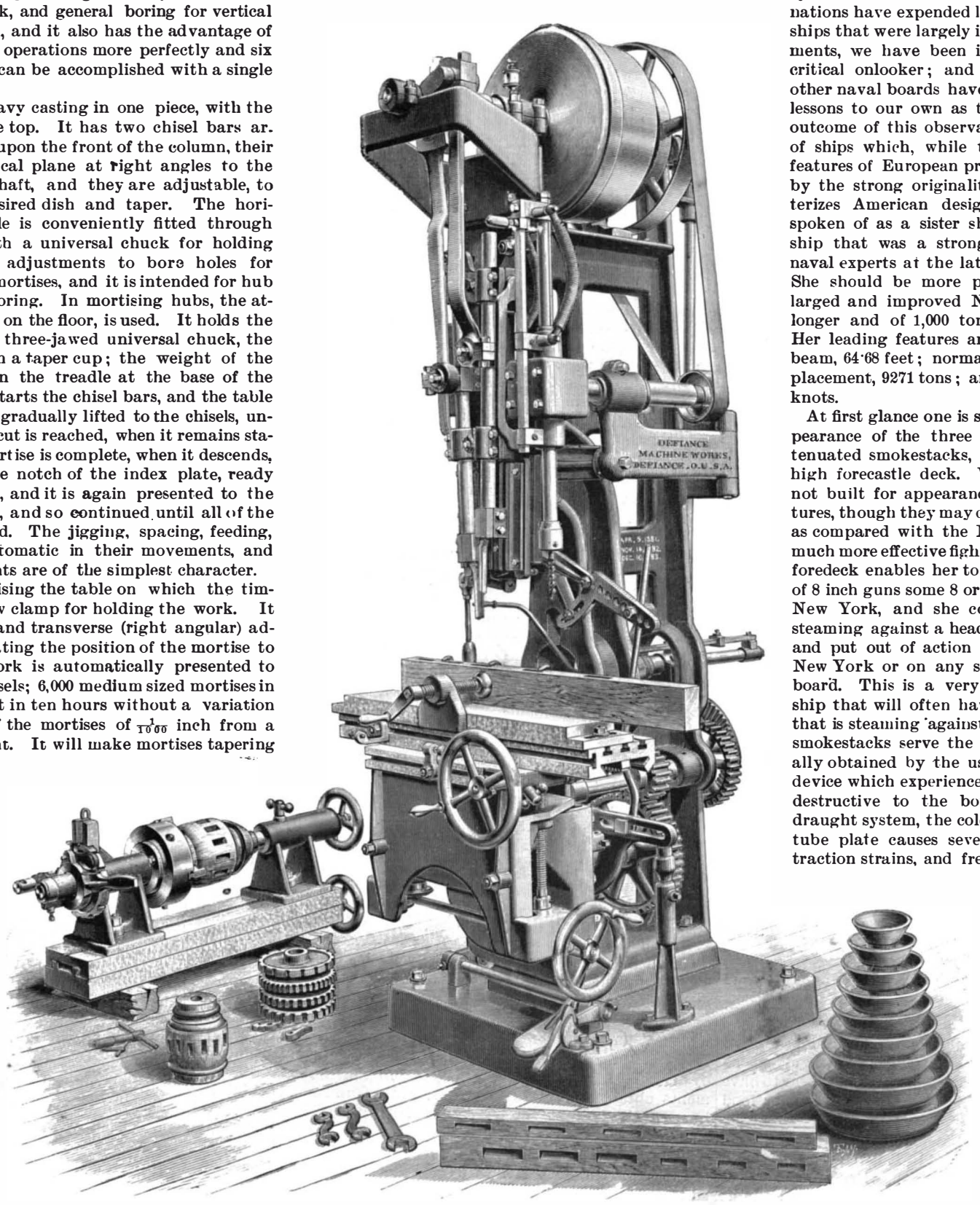
AN AUTOMATIC DOUBLE CHISEL MORTISING MACHINE.

This engraving represents an automatic double chisel mortising and boring machine, designed for automatically mortising hubs from the smallest sizes up to 11½ inches diameter, cutting the mortises straight or stagger at the rate of 400 hubs per day; it is equally well adapted for cutting mortises of the regular kind in hard or soft wood, from ⅛ to ½ inch wide, to 5 inches long, such as required in wagon, carriage, furniture and agricultural implement shops, and when not engaged in mortising, the boring spindles may be utilized as a regular boring machine. The machine is manufactured by the Defiance Machine Works, Defiance, Ohio. It will accomplish several distinct classes of work, hub mortising and regular carpenter mortising in straight work, and general boring for vertical and horizontal work, and it also has the advantage of effecting the several operations more perfectly and six times faster than it can be accomplished with a single chisel machine.

The frame is a heavy casting in one piece, with the driving power at the top. It has two chisel bars arranged side by side upon the front of the column, their axis being on a vertical plane at right angles to the axis of the main shaft, and they are adjustable, to give the mortises desired dish and taper. The horizontal boring spindle is conveniently fitted through the main frame, with a universal chuck for holding the auger, having adjustments to bore holes for straight or stagger mortises, and it is intended for hub work and general boring. In mortising hubs, the attachment, as shown on the floor, is used. It holds the hub at one end in a three-jawed universal chuck, the other end turning in a taper cup; the weight of the operator's foot upon the treadle at the base of the machine instantly starts the chisel bars, and the table carrying the hub is gradually lifted to the chisels, until the full depth of cut is reached, when it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate, ready for the next mortise, and it is again presented to the action of the chisels, and so continued until all of the mortises are finished. The jigging, spacing, feeding, etc., are entirely automatic in their movements, and all of the adjustments are of the simplest character.

For straight mortising the table on which the timber rests has a screw clamp for holding the work. It has a longitudinal and transverse (right angular) adjustment, for regulating the position of the mortise to be made, and the work is automatically presented to the action of the chisels; 6,000 medium sized mortises in soft wood can be cut in ten hours without a variation in the dimensions of the mortises of $\frac{1}{1000}$ inch from a specific measurement. It will make mortises tapering in either direction or parallel, as desired, or tapering at one end and perpendicular to the surface at the other end. No painstaking, difficult and uncertain jigging of a carriage is required, and no reversing of chisels.

The vertical boring apparatus is contained within an iron case completely covering the gears and so constructed that the center of the auger is always exactly in line with the center of the chisels, so that the object after being bored has only to be moved horizontally to bring in proper place under the chisels to receive the mortises. The boring spindle has a radial adjustment for boring holes to any angle. The friction drive pulley is 18 inches diameter, 5 inches face, speed 400 rotations per minute.



AN AUTOMATIC DOUBLE CHISEL MORTISING MACHINE.

Tears a Safety Valve to Emotion.

Tears have their functional duty to accomplish, like every other fluid of the body, and the lachrymal gland is not placed behind the eye simply to fill space or to give expression to emotion. The chemical properties of tears consist of phosphate of lime and soda, making them very salty, but never bitter. Their action on the eye is very beneficial, and here consists their prescribed duty of the body, washing thoroughly that sensitive organ, which allows no foreign fluid to do the same work. Nothing cleanses the eye like a good, salty shower bath, and medical art has followed nature's law in this respect, advocating the invigorating solution for any distressed condition of the optics. Tears do not weaken the sight, but improve it. They act as a tonic to the muscular vision, keeping the eye soft and limpid, and it will be noticed that women in whose eyes sympathetic tears gather quickly have brighter, tenderer orbs than others. When the pupils are hard and cold, the world attributes it to one's disposition, which is a mere figure of speech, implying the lack of balmy tears that are to the cornea what salve is to the skin or nourishment to the blood.

The effect of tears on the skin about the eyes, however, is intensely irritating and inflaming. They keep the epidermis in a dark, puffy condition, and in legends only do weeping women preserve the beauty of their great, white lids. The reason some women weep more easily than others, and all more readily than the sterner sex, has not its difference in the strength of the tear gland, but in the possession of a more delicate nerve system. The nerve fibers about the glands vibrate more easily, causing a downpour from the watery sac. Men are not nearly so sensitive to emotion; their sympathetic nature—the term is used in a medical sense—is less developed, and the eye gland is, therefore, protected from shocks. Consequently, a man should thank the formation of his nerve nature when he contemptuously scores tears as a woman's practice. Why facial distortions should be the usual accompaniment to the sobbing of the gentler sex there seems no satisfactory solution. It may be that the nerves, which lead to the muscles as wires to marionettes, twitch and pull them in this fashion while they are at work emptying the tear glands of their contents. That the copious shedding of tears "which breaks the ice-bound fetters of the heart" is a healthy action, all physicians assert. In some cases it is even thought to avert insanity. Even here the reason is scientific, for it is a sign of relaxation of the brain nerves from a tenseness that was congestion. Between man and monkey there is this essential difference of tears. An ape cannot weep, not so much because its emotional powers are undeveloped as the fact that the lachrymal gland was omitted in his optical make-up. So long as this differentiating quality between man and his primeval ancestors persists, we may laugh at the theory of Darwin, so far as it reflects upon our family tree; scorn all innuendoes of "missing links;" and see our handkerchief as the sign and symbol of man's chieftainship in creation.—Philadelphia Times.

THE LAUNCH OF THE ARMORED CRUISER BROOKLYN.

On the afternoon of the 2d inst. there was launched from the Cramp's shipyard one of the most perfect and thoroughly up-to date cruisers of modern times. In the building up of our new navy, the United States government have reaped much benefit from the fact that they were a little late in starting. While other nations have expended large appropriations on ships that were largely in the nature of experiments, we have been in the position of the critical onlooker; and the costly failures of other naval boards have been valuable object lessons to our own as to what to avoid. The outcome of this observation is seen in a class of ships which, while they embody the best features of European practice, are yet marked by the strong originality which ever characterizes American design. The Brooklyn is spoken of as a sister ship to the New York, a ship that was a strong favorite among the naval experts at the late naval review at Kiel. She should be more properly called an enlarged and improved New York, being 14 feet longer and of 1,000 tons more displacement. Her leading features are: Length, 400½ feet; beam, 64·68 feet; normal draught, 24 feet; displacement, 9271 tons; and calculated speed, 20 knots.

At first glance one is struck with the odd appearance of the three unusually tall and attenuated smokestacks, and the exceptionally high forecastle deck. Warships, however, are not built for appearance; and these two features, though they may detract from her beauty as compared with the New York, make her a much more effective fighting machine. The high foredeck enables her to carry her forward pair of 8 inch guns some 8 or 10 feet higher than the New York, and she could fight them when steaming against a head sea that would flood and put out of action the same guns on the New York or on any ship with a lower freeboard. This is a very valuable feature in a ship that will often have to chase an enemy that is steaming against the wind. The lofty smokestacks serve the purpose which is usually obtained by the use of forced draught, a device which experience has proved to be very destructive to the boilers. In the forced draught system, the cold air impinging on the tube plate causes severe expansion and contraction strains, and frequently starts leakage at the tube ends. There is no such difficulty attaching to natural draught, and experience in the English mercantile marine has shown that as good results can be obtained by lengthening the smokestacks as by the employment of the forced draught system. The armament will consist of eight 8 inch rifles in barbettes of 8 inch steel armor; twelve 5 inch rapid fire guns, protected by 4 inch steel armor; twelve 6 pounder rapid fire guns, and four machine guns. A complete steel protective deck, from 3 inches to 6 inches in thickness, will cover the ship from stem to stern.

The Brooklyn will carry five torpedo tubes, one in the bow and two on either broadside. Her total coal capacity will be 1,753 tons, and her normal capacity at normal displacement, 900 tons. She will have a full speed radius of action of 1,758 knots, and a 10 knot radius of action of 6,088 knots.

THE St. Louis is steadily improving on her previous performances in the Atlantic service. She left New York Wednesday, September 25, passing Sandy Hook at 1:30 P.M., and arrived off the Needles, Isle of Wight, at 7:35 A.M. on the following Wednesday, the time of passage being 6 days, 13 hours, 25 minutes. The record is held by the Hamburg-American liner Furst Bismarck, and stands as 6 days, 10 hours, and 35 minutes.

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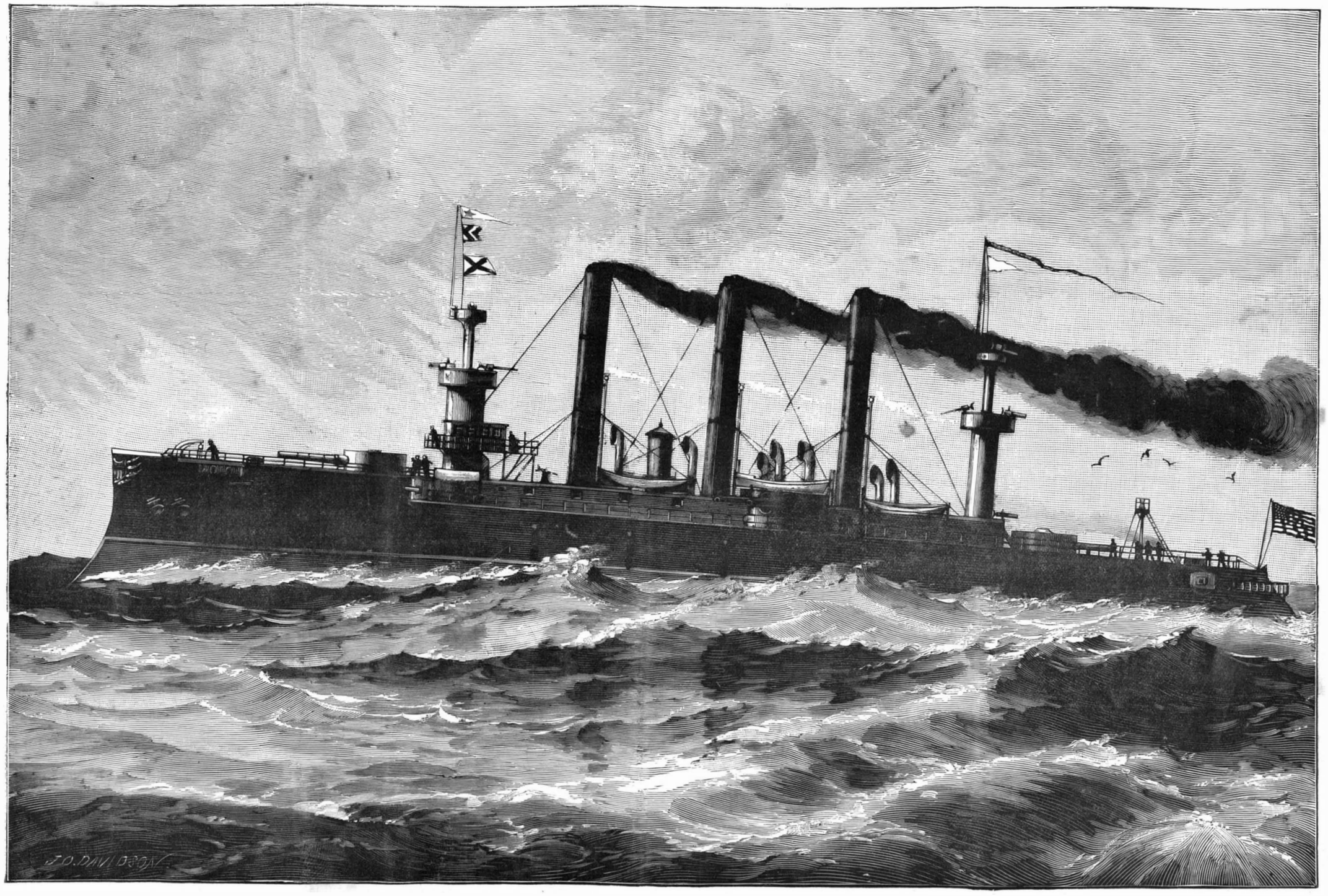

THE ARMORED CRUISER BROOKLYN, LAUNCHED AT PHILADELPHIA, OCTOBER 2, 1895.

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Waltzing Mice.

The following description of some very curious and interesting Japanese animals is communicated to Natural Science, London, August, by Edgar R. Waite, of the Museum at Sydney, Australia. The editor remarks in a note that the creatures have already been described in technical zoological journals more than once, though not until within two or three years. The general public, however, is quite uninformed regarding them, so that this popular account cannot fail to be interesting:

"Whatever th late war may have done toward increasing our knowledg of Japan and things Japanese, it was the means of introducing to me an interesting domestic animal, the subject of this article.

"The mice were obtained from Mr. Haley, of this city [Sydney], who received them from Japan. The original pair and nearly all the offspring for several generations are white, variegated with black, disposed about the head, nape, and root of the tail. The exceptions are reversions to the color of the wild brown mouse, and two instances in which the black is replaced by faint buff; the irides of these are pink, whereas those of the other mice are dark.

"At first, a visitor probably regards the mice as mere color varieties of the common white race. A moment's observation reveals the peculiarities of the breed, and attention is riveted by their strange performances. Early in life they exhibit the tendency which has earned for them the name above applied. When a mouseling leaves the nest its gait consists of an evident attempt to proceed in a straight line; this is frustrated by a tremulous movement of the head, which is nervously shaken from side to side. Shortly, a tendency is exhibited to turn; this develops into a rotatory motion, performed with extraordinary rapidity, which constitutes the peculiarity of the waltzing mouse.

"The ordinary routine of daily life is constantly interrupted by this mad disposition to whirl, frequently indulged in for several minutes, and, with an occasional stoppage of a few seconds, continued for hours. The floor of one of Mr. Haley's cages being somewhat rough, the mice actually reduced their feet to stumps before it was noticed. Like ordinary mice, they sleep during the day, but apparently waltz the whole night long. If, however, they are disturbed during daylight, they leave their bed and work off some surplus energy.

"The rotation is so rapid that all individuality of head and tail is lost to the eye, only a confused ball of black and white being recognizable. Very often they spin in couples, revolving head to tail at such a speed that an unbroken ring only is perceived. It is remarkable that they keep perfectly together; this may be attributed to their similarity in size and not to any special faculty they may possess. An upright peg forms a favorite pivot, but even without this guide they would not, in several minutes, cover an area larger than a dinner plate, and they easily spin under a tumbler. Sometimes three or four mice run together; the extra ones then form an outer circle, but as the evident desire is to rotate rather than revolve, more than two seldom work well. An individual generally spins in one direction only, and the majority turn to the left, only a small proportion going 'with the clock.'

"A waltzing mouse may be placed on the ground without fear of its escaping. Should it attempt to do so, it will not proceed far before being seized with a paroxysm, which it will be necessary to work off before further progress can be attempted. These mice may also be kept in a paper box, which would not detain a wild mouse an hour; the process of gnawing the walls of their prison will be so frequently interrupted by the necessity of practicing their infirmity that little damage can be done. As with all truly domestic mice, however, no determined effort to escape, such as characterizes the wild mouse, is ever attempted, and at most such efforts are to be regarded as an inherited habit rather than a real desire for liberty, for domestic mice do not readily leave when their cages are left open.

"The feature of the breed may be due to cerebral derangement, but that the trait is, at the present day, purely hereditary and not acquired by the individual, is shown by the fact that, as soon as they arrive at an age when other mice begin to run, these begin to waltz.

"They may be compared to tumbler pigeons, and the analogy is close, allowing for differences between an aerial and a terrestrial performance. The plane of motion is, however, quite different, as exemplified by Indian ground tumblers, which, when placed on the ground, turn head over heels. In both cases the affection is the result of perpetuation by heredity of an affliction which would have insured the destruction of a wild race."

A PETROLEUM TRICYCLE.

The accompanying engravings illustrate a motor tricycle which has been made for experimental purposes, and has run considerable distances, by Mr. J. H. Knight, of Farnham, Eng. Mr. Knight has been one of the pioneers in the construction of oil engines, but for this motor cycle he at present uses a gasolene engine, although in a few months he expects to be running with an oil engine. The engraving—from a photograph—shows the general arrangement of the carriage or motor tricycle, and the annexed diagram shows the arrangement of the engine and intermediate driving gear.

We are indebted to the Engineer, London, for our illustrations and the following particulars: The engine runs constantly. On the crank shaft are two

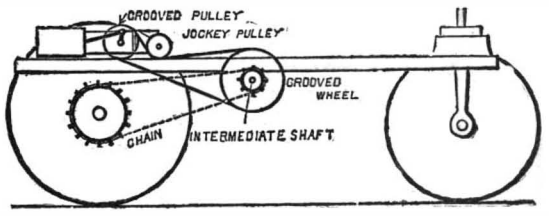

DIAGRAM OF GEARING.

corresponding grooved wheels, and on the intermediate shaft are two grooved wheels. These provide the change of speed. The pulleys and wheels are coupled by loose ropes, and these ropes are tightened by the jockey pulleys. The three levers seen in the photograph are for the two speeds and the brake. The outer levers with the toothed quadrants are the levers for working the two jockey pulleys; the center one is the brake.

The carriage weighs in running order about 1,075 lb. The gasolene engine is on the Otto cycle, and has a piston 3¼ in. diameter and 4½ in. stroke, developing rather over three-quarter brake horse power at 500 revolutions. The driving wheels, or rather the hind wheels—for one wheel only is a driver—are 3 ft. diameter, and the steering wheel 2 ft. 6 in. All have 1½ in. solid rubber tires. Two speeds are arranged for, corresponding to about 3½ and 7½ miles per hour. No

A PETROLEUM TRICYCLE.

arrangement for reversing is used or thought necessary. The cooling water for the engine cylinder is contained in a tank under the seat, and a current of air is drawn by the exhaust over the water, and cools it to a considerable extent. We are informed that the motor cycle is almost silent in running, and that horses take no notice of it.

With one person on it, it will run 7½ miles per hour on fairly level roads, and has run at from 8 to 9 miles per hour for short distances. With two passengers the speed is somewhat less.

The Pressure of a Gun Blast.

Recently, with a view to the practical determination of the effect of a blast from heavy gun firing over a protective plate, Commodore Sampson had a series of experiments made at the Indian Head Proving Ground which are described in the American Engineer and Railroad Journal.

The Indian Head experiments were interesting and are the first of the kind ever held. Lieutenant Mason, the officer in charge of the proving ground, conducted them. An 8 inch gun was employed. Under its muzzle was placed a 7 inch armor plate, which was 8 square feet and weighed about 8 tons. The center of the plate was 20 inches in front of the muzzle and about 4 feet below it. Over the plate and nearly parallel with it was secured a 1 inch wrought iron plate, 74 inches long by 68·5 inches wide. It weighed about ⅝ of a ton and was supported at each corner with a 2 inch armor bolt screwed into the corner holes in the back of the 7 inch plate below. The corner holes in the bottom of the plate were not directly below the holes in the corners of the wrought iron plate. Consequently, they were bent to bring their upper ends into the proper position. The center line down the length of the 1 inch plate was parallel with the axis of the bore of the gun, prolonged 0 25 of an inch to the right and 24 inches below, the surface of the plate being inclined 1 degree with the horizontal, the same as the gun. The muzzle of the gun projected from the rear of the 1 inch blast plate 17 5 inches. Two rounds were fired. In the first round the charge of powder was 100 pounds, the muzzle velocity 2,018 foot seconds and the pressure 16 tons. The elevation of the gun was 1 degree. The wrought iron 1 inch plate was bent downward at right angles to the line of fire along its central traverse line, the center of the plate being forced down by the blast 3·93 inches. A slight rotary movement to the left was also given to the plate. The 7 inch armor was not moved at all. In the second round the charge of powder was 107 pounds, the muzzle velocity 2,000 foot seconds and the pressure and elevation the same as in the preceding round. The blast plate was in the position produced by the first round. The effect of the second blast was merely an augmentation of that of the first fire. The lower plate was not moved in the least. After the second round the support of the right hand rear corner retained nearly its original position. The other three bolts had twisted to the right nearly 45 degrees. The second round crushed the plate downward about 7 inches, making the extreme deflection about 10 inches.

Berry Culture.

Winter protection is an absolute necessity for growing small fruits successfully in a northern climate. It should be practiced in every locality where the temperature reaches zero or below. With the high cultivation now practiced, a large and tender growth is stimulated; hence the greater necessity to maintain as uniform a temperature as possible throughout the winter. Even in localities where plants show no injury, and among those considered most hardy, the vitality is often affected, and the succeeding crop very much reduced.

The best winter protection for blackberries, raspberries and grapes consists in laying them down and covering lightly with earth. All old canes and weak new growth should be cut out and burned soon after fruiting, leaving only strong, vigorous plants. If plants have been well mulched in summer with green clover, clean straw or coarse manure, as they should be, less earth is required by using this mulching.

In laying plants down (the rows running north and south), commence at the north end, remove the earth from the north side of the hill about four inches deep, gather the branches in close form with a wide fork, raising it toward the top of the bush, and press gently to the north, at the same time placing the foot firmly on the base of the hill, and press hard toward the north.

If the ground is hard, or bushes old, a second man may use a potato fork instead of the foot, inserting same deeply, close to south side of hill, and press over slowly, bending the bush in the root until nearly flat on the ground. The bush is then held down with a wide fork until properly covered. The top of the succeeding hill should rest near the base of the preceding hill, thus making a continuous covering. This process is an important one, but is easily acquired with a little practice. In the spring remove the earth carefully with a fork and slowly raise the bush.

With hardy varieties, and in mild winters, sufficient protection may be had by laying down and covering the tips only. Grapes being more flexible, are laid down without removal of earth near the vine.

There is no more important work on the fruit farm or garden than winter protection, and there is no work more generally neglected. Let it be done thoroughly, after frosts have come and before winter sets in. Strawberries grow rapidly in October, and make many weak plants. Remove all runners starting this month, allowing four or five inches square space for each plant. This is necessary for best fruit.—M. A. Thayer, in Country Gentleman.

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THE ROYAL NATURAL HISTORY.

Edited by Richard Lydekker, B.A., F.R.S. Illustrated with 72 colored plates and 1,600 engravings. (London and New York: Frederick Warne and Company. June, 1895.) Published in 1s. parts. We reproduce two illustrations recently drawn for this work, namely, the Narina trogon and the Brazilian motmot.

Natural History Notes.

Remarkable Eye Structure in a Fish.—Mr. W. Tegetmeier has recently called attention to a fish which is very curious as regards the organization of its eyes, of which, like its congeners, it has two, although it well merits the name (tetraophthalmus) that attributes four to it. This fish has extremely bulging eyes, and when it is swimming upon the surface, as is its custom, half of the eye is above the surface of the water and the other half beneath the latter. Even externally, something abnormal is observed in these eyes. In fact, from the conjunctiva there starts a horizontal band of a dark color that divides the eye into two parts—an upper and a lower. But the division is more profound still. There is a sort of halving of the pupil so as to form two, an upper and a lower, to which correspond a common iris that tends to a division, in the sense that a fold of this membrane separates the upper iris from the lower. But all this would not permit the animal to see in the air as well as in the water were there not added a special arrangement of the crystalline lens. The crystalline of terrestrial animals has the form of a lens, but, in order to see in water, it requires a nearly spherical one. The Anableps possesses both such forms. Mr. Stewart, who has carefully dissected the optical organ of this curious fish, shows that the crystalline lens itself is likewise halved, the upper part being lenticular, while the lower part, beneath the conjunctival band, is nearly spherical. There is, therefore, in this case a very marked adaptation, the upper part of the eye being adapted for vision in the air and the lower part being conformable to the type required by vision in water. It is very probable that the structure of the upper half is acquired, although it would be difficult to prove the fact. Perhaps such adaptation might be made to disappear by causing the fish to live entirely under water.

Staining the Wings of Insects.—In No. 4 of volume I of the Biological Review of Ontario, Dr. H. W. Hill gives the following method, devised at the request of Dr. Brodie, of staining the veins in the wings of certain insects:

Place the whole insect in a strong alcoholic solution of fuchsin and allow it to remain there for forty-eight hours. Then transfer the insect to water with a pair of fine forceps and wash it until no more color comes away, changing the water if necessary. While the washed insect floats in clear water slip a microscope slide under it, raise the slide, holding the insect on it with a fine needle, separate the wings from the body with a fine scalpel and remove the body. With a drop or two of clear water on the slide float the wings into any desired position, keeping them flat and unwrinkled, taking care to have no bubbles under them. Remove any excess of water with blotting paper and allow the wings to dry. Then place a drop of thick Canada balsam near them and heat the slide over a spirit or gas flame. Tilt the slide so that the now liquefied balsam flows over the wings; lower a cover glass gently into position, and allow the preparation to cool. On examination the veins will be found red, the depth of the coloring varying with the length of time of staining, the thickness of the veins, etc. The color is well retained, so far as has been tried, and successful photographs have been made.

Heredity in the Color of the Hair of the Horse.—Mr. Wilckens, of Vienna, has found that two pure blooded English horses transmitted the color of their coat to their progeniture in 586 cases out of 1,000. When the parents are of different colors, the offspring are almost always of the color of the mother.

With Arabian horses, the facts are more striking still. The white color of the coat of the mare was found to be clearly transmitted in 729 cases out of 1,000. In other cases, there was a more or less marked mixture.

A Swimming Insect.—In 1864 Sir John Lubbock published in the Transactions of the Linnean Society, of London, an interesting note upon the Polynema natans. This hymenopterous insect has the habit of making use of its wings after the manner of fins. Since the above named epoch, the Polynema has been but rarely observed. Last month a correspondent of Science Gossip met with it anew and had an opportunity of observing it close by. He finds that the insect swims very well with its wings and moves about in the water at will in all directions.

Laccase in Plants.—Mr. G. Bertrand finds that laccase, the ferment originally found by him in the latex of the Tonquin lacquer tree, exists in a number of other plants. Thus, it occurs in the roots of beets, carrots, turnips, and dahlias, potato tubers, young asparagus stems, lucerne, clover and rye grass, the leaves of artichokes and beets, the fruits of apple, pear, quince, and chestnut trees, etc.

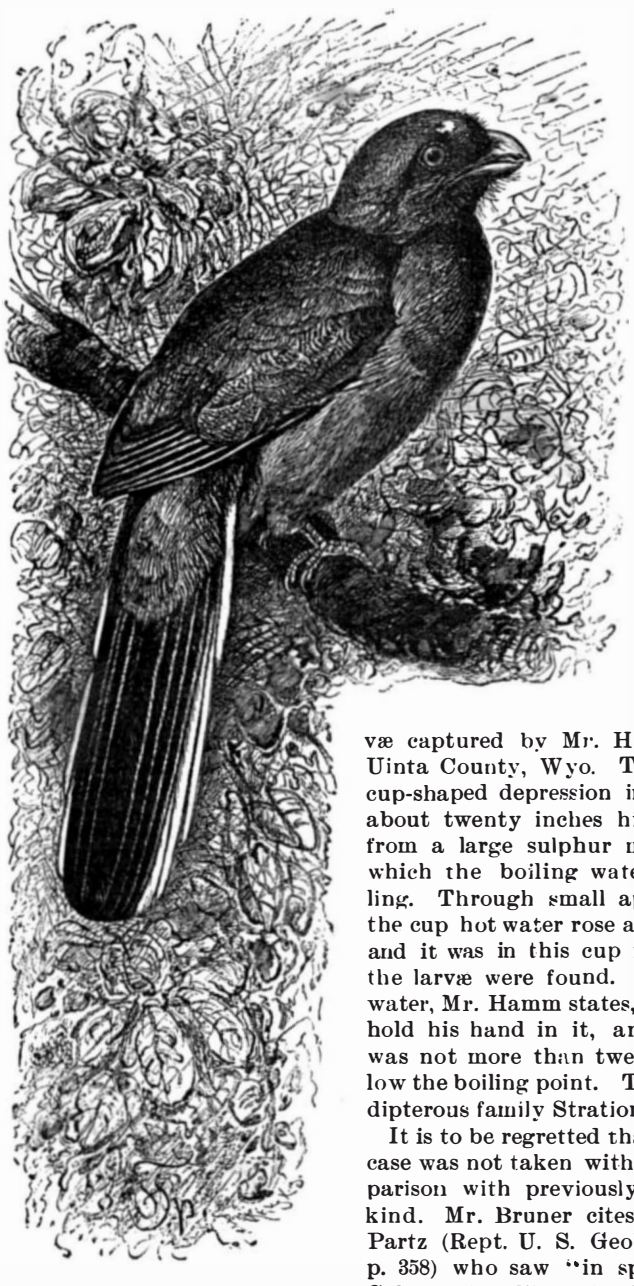
Longevity of the Pike.—According to the Eleveur, one of the pike of the aquarium of St. Petersburg is considered by a competent zoologist to have been hatched toward the end of the fifteenth century. Despite its 400 years of captivity and its age, it seems to be in excellent health.

Seeds and Germination.—The question of the influence of the size of seeds upon germination and upon the size of the plant that springs therefrom has been recently studied anew by Mr. B. R. Galloway, a summary of whose conclusions is given by the Gardeners' Chronicle. The weight and size of the seed are of great importance. A large seed germinates better and more quickly, and, with it, one can count upon having at the same moment from 85 to 90 per cent of the total crop, while with small seeds the crop reaches maturity only in successive periods of time, so that at no moment, in gathering the crop in toto could we have the same proportion of the whole. Besides, where with small seeds four successive crops are obtained, we have six with large seeds, their evolution occurring with greater rapidity.

An Instance of Intelligence in Ants.—The January number of Revista Brasileira, a monthly magazine just started at Rio Janeiro, contains an interesting note upon the intelligence displayed by the so-called sauba ant (probably Œcodoma cephalotes). It seems to be the general opinion that these ants spare the coffee trees that grow about the ant hills. They enjoy the shade afforded by these evergreen trees, whose roots penetrate their galleries, and hence endeavor to preserve them, despoiling only those which furnish them no protection. The writer of the note referred to witnessed near Rio an interesting exhibition of the intelligence of these insects. A "Rosinante" lodged in a stable built of boards was being daily defrauded of a portion of his rations by the saubas. We quote, says Insect Life, from a translation from the Portuguese kindly sent us by Mr. J. C. Branner:

No sooner was the corn put in the feed trough than the scouting ants announced the fact, and a line of workers was immediately established, and, penetrating by the cracks between the boards, they came out, each one loaded with a grain of corn, with which it descended on the outside. In this descent there was a reëntrant angle, difficult to cross; a single worker stationed itself there and undertook to help the others over. It did this by taking part of the weight of the grain of corn and backing across ahead of its companion until it had got it in a safe place. After helping one it returned to meet another, and continued this apparently voluntary task as long as this systematic robbery lasted.

BRAZILIAN MOTMOT.



NARINA TROGON.

Animal Life in Thermal Springs.—In the Lincoln (Neb.) Evening Call of April 6, 1895, Professor Lawrence Bruner records under the above heading the receipt from Hon. John C. Hamm of living larvæ captured by Mr. Hamm in a hot spring in Uinta County, Wyo. The larvæ were found in a cup-shaped depression in the top of a small cone about twenty inches high, situated a few feet from a large sulphur mound or "dune," under which the boiling water could be heard rumbling. Through small apertures in the bottom of the cup hot water rose and overflowed the edges, and it was in this cup filled with hot water that the larvæ were found. The temperature of the water, Mr. Hamm states, was so hot he could not hold his hand in it, and he estimates that it was not more than twenty or thirty degrees below the boiling point. The larvæ belonged to the dipterous family Stratiomyiidæ.

It is to be regretted that the temperature in this case was not taken with a thermometer for comparison with previously recorded cases of this kind. Mr. Bruner cites the statement of a Mrs. Partz (Rept. U. S. Geol. Surv. for 1878, Pt. II, p. 358) who saw "in springs in Owens Valley, Cal., a spider-like animal and small red worms in water having a temperature of 124° F."

To this may be added Mr. H. G. Hubbard's statement in a letter published in the Canadian Entomologist of 1891 (p. 226), that in the Yellowstone National Park he saw a little Salda running about the edges of springs which were actually boiling. He also observed two species of Nebria living under pieces of geyserite "even on the sides of the cones of the largest spouting geysers, where they were liable to be washed away in a flood of boiling water." Professor A. S. Packard (American Naturalist, 1882, p. 599) also records such a case, he having received from a Mr. Griffith the larva of a Stratiomyia found in a hot spring in Gunnison County, Col. In this case the temperature of the water is stated to have been 157° F.—Insect Life.

Growth of Plants Under Colored Glass.—It is well known, from experiments, that certain luminous rays exert a favorable influence upon vegetation, while others have an injurious action. It has been asserted that the orange colored light corresponding to the absorption spectrum of chlorophyl has a peculiarly marked action. Professor Zacharewicz, of Vaucluse, has experimented with glass of various colors in the forced culture of strawberry plants, and reaches the following conclusions:

(1) The finest and earliest fruit is obtained under ordinary glass. (2) Orange colored glass produces an

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exaltation of the vegetation, but to the detriment of the quantity of fruit, its size and its earliness. (3) Violet glass gives a larger number of fruits, but small and of inferior quality and somewhat late. (4) Red, blue, or green glass are injurious to the vegetation of plants.

Habits of the New Zealand Kea.—In the last number of the Zoologist Mr. Taylor White gives some interesting information about the kea (Nestor notabilis), the New Zealand parrot that is so often cited as an example of a graminivorous bird that is capable of becoming carnivorous, and that has the reputation of attacking sheep in order to consume the very delicate fat that surrounds their kidneys. Mr. White lives in New Zealand and has been able to make a close observation of the bird under consideration.

According to him, the kea lives mainly upon lichens and not upon fruit and seeds, for it is found only at a distance from and outside of forests, upon rocks and bare ground. Like other animals that have not yet made the acquaintance of the natural perversity of man, the kea did not fear the latter at first, but allowed itself to be approached, captured, and caressed. In captivity it eats bread and meat. Its very powerful bill permits it to gnaw the strongest wooden bars of a cage. As for its carnivorous habits, Mr. White says: Toward 1861, sheep were introduced, and some years afterward it was observed that a certain number of them were dying, and upon the back of these, behind the shoulders, or at the level of the kidneys, a wound was perceived.

At the end of some time it was discovered that the offender was the kea, which always preferred animals with a long fleece, as it could obtain a better hold on these with its claws. It never seems to seek grain or meat, has never been seen around a dead animal, and the probabilities are that it drinks blood. What has been said of the kea, then, is probably true; it attacks sheep. But it is naturally carnivorous, for to the fruit and seed that it may meet with it adds insects. It has not, then, changed its diet in adding the sheep to its bill of fare, but has simply extended its depredations. It has generalized.

BEHRING'S law says that the blood and blood serum of an individual which has been artificially rendered immune against a certain infectious disease may be transferred into another individual with the effect to render the latter also immune, no matter how susceptible this animal is to the disease in question.

Railways as Infringers of Patented Articles.

The announcement that the Siemens-Halske Electric Company, of America, has brought suit against the Metropolitan West Side Elevated Railway Company, of Chicago, to restrain it from infringing their patents covering the third rail and contact system of propelling electric cars, will probably create more or less envy in the breasts of the manufacturers of railway supplies for the steam roads of this country. For it is a fact that as matters now stand these manufacturers do not dare to sue steam railroads, even if the infringement is of the most flagrant character. This is a strong statement, but unfortunately it is true, and it goes without saying that a great injustice is thereby being done to manufacturing interests.

The steam railroads of this country have organized what is known as the Eastern and Western Railway Association, one of whose duties is to furnish to the roads that are members opinions on patents covering articles that are offered to them for purchase. This is an important duty, and was undertaken to protect the railroads from damages incurred from ignorantly or thoughtlessly using patented articles that were infringements. It is a wise provision, and rightly carried out should be satisfactory to all concerned, as it acts to protect alike the rights of the manufacturer and the purchaser. But it soon came to be understood that he who sued a member of one of these associations would incur the displeasure of the other members and might find it difficult to do any business with them. This has been held to be a reasonable restriction to place upon sellers of railway supplies, and it is conceivable that if every one was perfectly fair in such matters, no harm would be done. Unfortunately, the implied rule has operated to make some roads careless, and it is charged that others have deliberately taken advantage of it. They feel, says the Railway Master Mechanic, that they will not be sued in any event, and they therefore are disposed to use any device that meets their fancy, leaving the manufacturers to fight out the matter among themselves. The firm whose patents are infringed thus sees railroads patronizing concerns making articles which expert opinions from the railroad's or association's attorney would pronounce infringements.

And what course can such a firm pursue? It dare not sue the railroad, for if it does, it antagonizes other railroads not already involved, and its business may suffer thereby. If it sues the manufacturer, the railroad goes on buying from the latter under promise of protection from damages, and from the profits of such sales the infringing manufacturer fights his case. The suit may drag for several years, and when decided in his favor, he is unable to collect damages from the irresponsible concern, and can only look back over several years of damaged business and expensive litigation, which represents the expense of wiping out the unfair competition. It is needless to say that when railway officials are interested in the infringing concern, there are further complications.

It is in the power of railway officials to remedy this state of affairs. To remove the implied restriction relating to suits against railway companies may not be necessary, but it does appear that unless this is done justice requires the greatest care be exercised in the purchase of supplies that may possibly be infringements.

Mark Twain's Yell.

Mark Twain, who recently started on a tour round the world, told an interviewer at Winnipeg how he often felt a desire to "cut loose" from civilization and to get away by himself where he could run and yell to his heart's content. In this connection there is a story about the humorist and Canon Kingsley. Walking along the streets one day, Mark felt the impulse to yell coming on him with irresistible force, and said to Kingsley, "I want to yell, I must yell." The canon said, "All right, yell away; I don't mind." "And with that," said Mark, "I stepped back a few steps, and, throwing my arms above my head, let out a war whoop that could be heard for miles, and in less time than you could count Canon Kingsley and myself were surrounded by a multitude of anxious citizens who wanted to know what was the matter. I told them nothing was the matter. I just wanted to yell, and had yelled."

Centenarians in France.

A census of centenarians recently taken in France gives 213 persons of one hundred years or over, 147 of them women and 66 men. The oldest was a woman who had just died at one hundred and fifty, in a village of the department of Haute Garonne. Nearly all the centenarians belonged to the lowest ranks in life.

THE British Institution of Civil Engineers, in its instructions for preparing papers to be read at its meetings, requests that the use of the personal pronoun be avoided. This will be sad news to those who are fond of detailing the performances of little "I," and will tend to abbreviate many of the presented documents.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

TRAIN PIPE COUPLING.—Frank R. Bischoff, New Castle, and John C. Baird, Cheyenne, Wyoming. In clutch couplings adapted for automatic engagement and disengagement, these inventors have devised an improvement whereby, when the cars are uncoupled, the train pipes of the opposing cars will separate readily, the ribs of the male sections leaving the prongs of the female sections. Each end of the pipe has a forked or U-shaped extremity, and the forks are drawn out until collars come in contact with stops, when the couplings part, leaving the forks projecting beyond the ends of the drawheads and in position for re-engagement. The improvement affords a quick, sure, and strong coupling, with a tight and positive interlocking engagement between the opposing sections.

RAISING AND LOWERING CAR WINDOWS.—Horace Holbrook and Thomas S. Beals, Jr., Coupeville, Washington. This is a pneumatic device by means of which the windows may be raised or lowered by air pressure from the air brake pipes. At each window is a piston fitted to slide in a cylinder and having its piston rod connected with the window sash, while pipes from the air brake system connect with the upper and lower ends of the cylinder on opposite sides of the piston, and a valve controls the admission of air to either end of the cylinder to force the window up or down.

Electrical.

TELEGRAPHIC VIBRATOR.—Paul La Cour, Askovshus, Denmark. This invention relates to vibrators producing different electric signals by generating intermittent currents to act upon distant vibrators having only the same speed of vibration. The essential point of the invention is the use of a body, as a pendulum, in its normal position in contact with a vibrator, but when the latter is set in motion the pendulum body is pushed forward and held by a catch, establishing thereby a different electrical condition, and causing a signal to be transmitted until the pendulum body is returned to its normal position.

DISTRICT TELEGRAPH AND TELEPHONE SYSTEM.—Edgar E. Salisbury and Albert E. Dean, Tacoma, Washington. This invention combines with district telegraph call boxes and central office apparatus a telephone system for verifying the signals of the call box and giving orders for messengers, saving the time of the messenger in going to the home of the subscriber. One of the arbors of the call box has a telephone-supporting lever to wind the actuating spring of the call box by the weight of the telephone, but capable of being lifted by the spring when the lever is released by the removal of the telephone. A telephone cut-out is operated by the supporting lever, and there is a key for grounding the line at either side of the call box.

ELECTRIC GENERATOR ATTACHMENT.—George W. Pickett, Denver, Col. According to this improvement, the dynamo has the usual commutator, and an auxiliary commutator has whole and half contact rings, a pair of brushes being oppositely arranged to contact with the half ring, a brush to contact with the whole ring, and mechanism for giving an irregular speed to the auxiliary commutator. The improvement is designed for use in connection with reciprocating plungers working in connection with solenoid or other magnets oppositely arranged and adapted to reciprocate between them a plunger which can be utilized for working a rock drill or other reciprocating mechanism.

LINEMAN'S VISE.—John Ryan, New York City. This is a hand vise in which the jaws present a maximum of bearing surface and have a parallel movement, while they may be readily manipulated either to open or close them. One jaw is fixed and the other movable, an adjusting screw engaged by a nut being connected to the fixed jaw, and there being a spring connection between the nut and the movable jaw. The vise is designed to be particularly useful in running electric or other wires.

Mechanical.

VALVE GEAR.—Millard F. Hill and Clifton W. Easley, Henrietta, Texas. This is an improvement in gears in which but a single eccentric is used, there being devices by which the eccentric may be shifted on the shaft and locked in various positions to effect a reversal or a stoppage of the engine with a full head of steam on, and to run the engine in either direction. The automatic or non-automatic reversals are so arranged as to not interfere with each other.

VALVE.—George W. Graffin, Allentown, Pa. Two valves are movably mounted in a casing and adapted to be seated on the valve seat when moved in different directions, while an abutment movably secured in the casing opposite the valve seat is adapted to be engaged by each valve when moved. The improvement affords a double valve arrangement, either adapted for use in the ordinary way to open or close the valve, and one valve being removable for repairs while the other is kept in use. The valve may be easily taken apart for repairs, and works positively.

PIPE JOINT.—Michael Sexton, New York City. To unite pipes without threads cut on their ends, and without solder, calking, or flanges, this inventor has devised an improvement comprising a sleeve in the ends of which screw exteriorly threaded collars having at their inner ends bevels, while wedge-shaped rings are engaged by the bevels of the collars and pressed upon the pipe periphery at or near the pipe ends.

Agricultural.

SUBSOIL PLOW.—Peter Heintz, Grand Island, Neb. The subsoil attachment, according to this improvement, comprises a share and an adjustable shank, a shoe being connected with the mould board of the share to prevent its springing, while breakers are attached to the mould board to pulverize the soil, and a cutter at the front of the shank extends down to the land side to break the ground as the plow penetrates it. The attachment may be applied to any plow, and the upper section of the shank may be adjusted to accommodate itself to any shape or position of handle, standard, or other support.

SULKY ATTACHMENT FOR PLOWS.—John A. Duttera and Joshua F. Flickinger, Hanover, Pa. This attachment is applicable to any form of plow having a beam, being adjustable to plow beams of different shapes and sizes without cutting or boring into them. Means are also provided for simultaneously adjusting both the running wheels of the sulky, to raise or lower the plow or lift it entirely out of the ground, or for adjusting only one of the wheels to adapt the sulky for use on a hillside.

Miscellaneous.

TREATING ZINC BEARING ORES.—Edgar A. Ashcroft, Broken Hill, New South Wales. This inventor has devised a combined electrolytic and leaching treatment of sulphide ores and products, by which the oxidized ore is first leached with a solution containing ferric salt, to precipitate the iron and dissolve the zinc, then electrolyzing the resulting zinc-bearing solution by first passing it around metallic cathodes to precipitate the zinc and around iron cathodes to impart a ferrous salt to the solution, the ferrous salt being subsequently raised to the ferric state to regenerate the original ferric salt solution. The process is also suitable for the treatment of zinc oxide ores or the admixtures of zinc oxide with any matrix having no objectionable influence on the various operations.

ARROWHEAD SHAPED VESSEL.—Mark Golinsky, St. George, Bermuda. An improved form of hull designed to afford increased speed and steadiness is provided by this invention. The bow or front portion of the hull presents in plan view the form of an arrowhead, and the body of the hull at the rear of the bow is at all points of less width than the widest portion of the bow. The screws or other propelling means are located behind the angles of the arrowheads on each side.

MUSIC LEAF TURNER.—William E. Somers, Sag Harbor, N. Y. By means of this apparatus the leaves of a book or sheet music may be readily turned from right to left or left to right. At each side of the center of a shaft are adjustable spurs engaging by means of a trip a swinging arm which engages the sheet, while a spring-controlled rack is operated by a pinion, there being a connection between the rack and a key. By this improvement the leaves are quickly and conveniently turned, the pages being sure to be presented as desired.

BINDER FOR NEWSPAPERS, ETC.—Joseph W. Wood, Baraboo, Wis. A cord secured to the binder frame, according to this improvement, forms longitudinal rims, and strips are pasted down on the cover over the outer rims of the cord at opposite sides of the frame, whereby the cover is secured to the frame, the whole device forming a simple, durable and inexpensive binder for loose papers, pamphlets, etc.

BATH.—Fernando Ponce, Tulancingo, Mexico. This inventor provides a bath which will permit of applying a shower or jet with a constant pressure for a few seconds or any length of time desired, the pressure under which the water issues being readily regulated. A water barrel in which moves a piston is surrounded by a tubular standard, perforations in the upper part of the barrel leading into the space between the barrel and its tubular casing, while a weight connected to the piston has guided movement on the standard, and discharge pipes are adapted to receive the water forced out of the barrel by the weighted piston.

CAMP STOOL.—Henry Leovy, New Orleans, La. This is a stool which may be readily folded up for conveniently carrying about in the form of a cane. It has a center piece adapted to receive the ends of two sets of rods, the lower set forming the legs and the upper set supporting a canvas seat.

HAIR CURLER.—Herman Neumann, New York City. Short or long hair may, by the use of this device, be clamped and wound around a support in a manner to produce a curl, a retaining member of the device being at the same time manipulated to maintain the hair in its curled position around the support.

SHOE BLACKING.—John B. Bernard, St. Paul, Minn. This blacking is designed to produce a lustrous shine with but a few strokes of the brush, while it does not soil any article coming in contact with the shoes, and will keep the leather pliable. Among its constituents are boneblack, muriatic acid, linseed oil, sugar, gelatine and borax.

CUSPIDOR CLEANER.—Alfrid Larson, Wausau, Wis. This is a device arranged to be opened and rotated after insertion into the cuspidor, to clean the inside. It consists of a two-part spherical brush carried by a shaft and handle in such a way that the brush head may be conveniently spread out or opened.

Designs.

RECEPTACLE FOR COINS.—George and William Benze, New York City. In a suitable base is a circular figure having a concave, disk-like appearance, in the center of which is a representation of a coin, medallion, or the like.

SASH LOCK.—Adolphus A. Shields, Huntsville, Ala. The leading feature of this design is a novel and ornamental form of head, with parts convenient for engagement by the thumb or fingers.

GLASS VESSEL.—Harry T. Broden, Brooklyn, N. Y. Two design patents have been issued to this inventor for somewhat similar glass dishes of a highly ornamental character, in which prisms cross one another at different angles, in connection with conical panels, cross panels and checkering, affording prismatic star figures, etc.

HEATER.—John T. Cullen and Leslie P. Grimes, Clinton, Iowa. The lower or tank portion

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of this heater is oval in plan, and a transverse arch rises centrally in the tank from its bottom, extending between the front and rear walls.

DISPLAY STAND. — Jefferson D. Goddard, Kansas City, Mo. This stand comprises a base and vertical standard carrying at its top a pennant, while midway is an irregular, box-like figure with open sides and vertical partitions, the central portions of the top and bottom of the box-like figure being higher than the side portions.

TRIMMING. — Friedrich Hassenpflug, New York City. According to this design, loop-like wings extend at angles one to the other, in groups, radiating from a common center.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE METALLURGY OF IRON AND STEEL. By Thomas Turner, Associate of the Royal School of Mines. Vol. I. The Metallurgy of Iron. London: Charles Griffin & Company, Limited. Philadelphia: J. B. Lippincott Company. 1895. Pp. 367. 8vo. 80 illustrations. Price $5.

This is a volume of Griffin's Metallurgical Series, which is edited by Professor W. C. Roberts-Austen, C.B., F.R.S. The present work is one of a series of treatises on metallurgy written by associates of the Royal School of Mines. The history of the manufacture of iron and steel is treated more fully than is usual in metallurgical treatises, as is also the section dealing with foundry practice and with the reactions of the puddling furnace. The author has paid particular attention to these branches of the subject. A special chapter has been devoted to the corrosion of iron and steel, as this is a subject of great importance in connection with the permanence of modern structures. The special bibliographies are of great value, giving references not only to books, but to periodical literature as well. The work abounds with tables and other data, some of it heretofore unpublished, which cannot but prove of value to all who are engaged in manufacturing iron, and to the student of metallurgy as well.

TEXT BOOK OF THE PRINCIPLES OF PHYSICS. By Alfred Daniell, M.A., LL.B., etc. New York and London: Macmillan & Company. 1895. Pp. 782. 8vo. 257 illustrations. Price $4

This is the third edition of Daniell's Physics, a work which, since the publication of the first edition in 1884, has achieved a most enviable reputation. The work is a recognized standard wherever the English language is understood. It is withal one of the most readable works on physics among those not intended for popular use. The plan of the work is that of a gradual progression from the simpler to the more complex subjects. No preliminary knowledge of principles is assumed, and every effort is made to attain lucidity of expression. The aim of the author has not been to build up a mere compendium of physical facts, but rather to put the reader in possession of such principles as will enable him with small difficulty to apprehend and appreciate these facts. The present edition includes the sixth thousand, which speaks very well for a scientific book which does not appeal to a popular reader. The arrangement is admirable, and many of the facts printed in small type are of the greatest value. An excellent bibliography is provided.

IRRIGATION FARMING: A HANDBOOK FOR THE PRACTICAL APPLICATION OF WATER IN THE PRODUCTION OF CROPS. By Lute Wilcox. New York: Orange Judd Company. 1895. Pp. 312. 12mo. 95 illustrations. Price $2.

Irrigation has become an important factor in modern agricultural pursuits, and it is becoming more or less essential in all parts of the country, so that the need of more specific knowledge regarding it has led the author to write the present book. By means of this work any one can set about constructing an irrigating plant of any given capacity and can proceed to irrigate his land intelligently and correctly. The book is primarily written for and adapted to the use of our Western farmers, but it will prove equally valuable to the farmers of the South and other sections of the country. The text is clear and concise and cannot but be of value to the farmer. The concluding portions of the book give an admirable review of the common law of irrigation and a glossary of irrigation terms.

A GUIDE TO SYSTEMATIC READINGS IN THE ENCYCLOPEDIA BRITANNICA. By James Baldwin, Ph.D. Chicago and New York: The Werner Company. 1895. Pp. 316. 8vo. Price $2.

Although the Britannica has long been recognized as one of the greatest of reference books, and although its possessors may never have consulted it without complete satisfaction, its full value has seldom been recognized. It is usually regarded simply as a repository of general information to be kept at hand for consultation as occasion may demand. While this is the ordinary use of the Britannica, it may be utilized in such manner as to perform the office of a great educational agent. The present work shows how this may be done. The plan has been to direct each individual how to draw from this great storehouse of knowledge that which will cover with all desirable completeness the line of work in which he is most interested. This is done by an elaborate series of references which have been arranged according to the subject. The work is an admirable one and is worthy of great success.

PRIMER OF PHILOSOPHY. By Dr. Paul Carus. Chicago: The Open Court Publishing Company. 1895. Pp. 232. 12mo. Price 25 cents.

It is not expressly designed to give instructions to beginners in philosophy, but it is nevertheless available for that purpose. The uninitiated student will not be bewildered or mystified, in perusing its pages, by unintelligible phrases. The subject is presented with great simplicity, so that the leading idea may be gathered by a glance at its contents. The most essential technical terms are explained, and the high practical importance of philosophy is never lost sight of. The point of view adopted by the author is new to the extent that it cannot be classified among the schools of recent thought. It represents rather a critical reconciliation of rival philosophies of the type of Kantian apriorism and John Stuart Mill's empiricism.

JUSTUS VON LIEBIG: HIS LIFE AND WORK, 1803–1873. By W. A. Shenstone, F.I.C. New York: Macmillan & Company. 1895. Pp. 219. 16mo. Portrait. Price $1.25.

The name of Liebig is familiar to all who are in any way acquainted with the science of chemistry, but many will doubtless like to have had a clear idea of why chemists admire and esteem him. The author has found that the prevailing impression concerning Liebig was that he was a man who gained a large fortune by making extract of beef. He has, therefore, made it his object in writing this little book, not so much to dwell upon Liebig's private life as to tell what he was, what he did and why all chemists and those who are versed in the history of science admire and esteem him so greatly. The work is written in admirable style and gives details of his great discoveries in pure chemistry, fermentation and agricultural and physiological chemistry.

WASHINGTON; OR, THE REVOLUTION. A drama founded upon historic events of the war for American independence. Part I. By Ethan Allen. Chicago: F. T. Neely. 1895. Pp. 212. 12mo. Illustrated. Price 50 cents.

This drama is divided into two parts; each part consists of five acts. The chief aim of the author has been to secure to the reader a personal intimacy with the actor in the great struggle which made the United States of America.

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References to former articles or answers should give date of paper and page or number of question.

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(6629) J. R. says: Will you kindly tell me through your valuable columns how to make a hair stain from walnuts? A. The simplest form is the expressed juice of the bark or shell of green walnuts. To preserve the juice, a little alcohol is commonly added to it with a few bruised cloves, and the whole digested together, with occasional agitation, for a week or fortnight, when the clear portion is decanted, and, if necessary, filtered. Sometimes a little common salt is added with the same intention. It should be kept in a cool place. The most convenient way of application is by means of a sponge.

(6630) G. W. H. says: Will you kindly publish the process of making beef, iron and wine? A. Liebig's extract of beef ½ ounce avoirdupois, ammonio-citrate of iron 256 grains, spirit of orange ½ fluid ounce, distilled water 1½ fluid ounce, sherry wine sufficient to make 16 fluid ounces. Dissolve the ammonio-citrate of iron in the water, dissolve the extract of beef in the sherry wine, add the spirit of orange and mix the solutions.

(6631) J. E. S. asks: Does a wheel go around the axle? Does the outside of a wheel go around the hub? A. There is much misapprehension in the numerous phases of this class of questions. A wheel as a whole does not go around the axle, although all of its parts revolve around the axle when it is running. The hub turns with the rim, and although there is no change of relative position of parts of rim and hub, yet it may be truly said the rim goes around the hub, for every part of the rim is consecutively on every side of the hub.

(6632) H. E. H. asks how to estimate the force of a blow made by a steam hammer, when the end of piston serves as the hammer; also would there be much diminution of the force of the blow, if transmitted through another piece of metal held tightly against the object to be hammered? Is there any way by which the force of a blow from a hammer actuated by a spring can be determined? A. The force of a blow in a steam hammer, and other forces, are explained and the method of computation carried out with examples in SCIENTIFIC AMERICAN SUPPLEMENT, No. 862. There will be a considerable diminution of the force in transmitting a blow through another body, depending upon its weight and rigidity. Cast steel, when hardened, being the most rigid of the metals for transmitting a blow. The force of a blow from a hammer actuated by a spring may be known by the method of computation for a steam hammer; the weight and the actual pressure of the spring, with the acquired velocity, being the elements for computation, as shown in the article on "Impact or the Force of Percussion," in the SCIENTIFIC AMERICAN SUPPLEMENT as above named.

(6633) G. M. asks for a rule used for calculating the contents of a barrel. A. To find the volume of a cask of any form. Add together 39 times the square of the bung diameter, 25 times the square of the head diameter, and 26 times the product of the diameters. Multiply the sum by the length, and divide by 26,470 for United States gallons.

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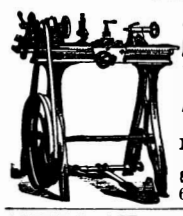

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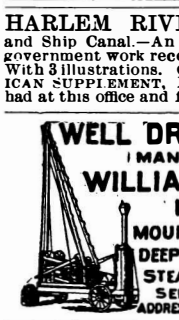

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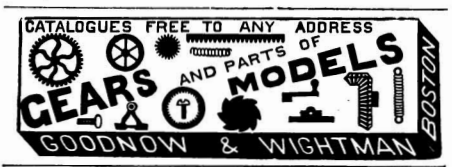

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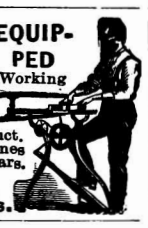

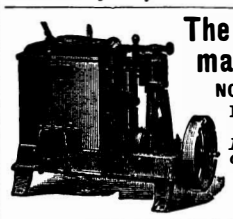

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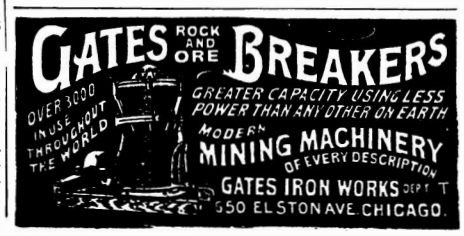
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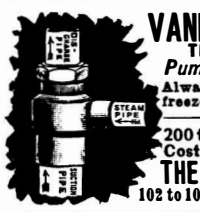

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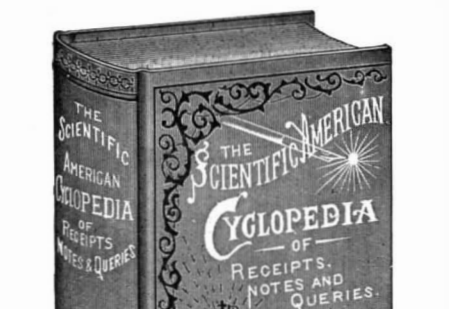

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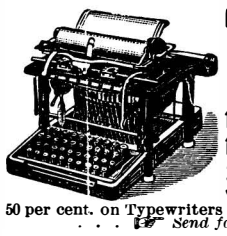

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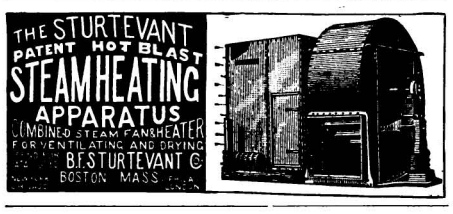

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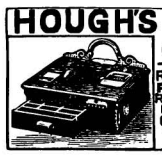

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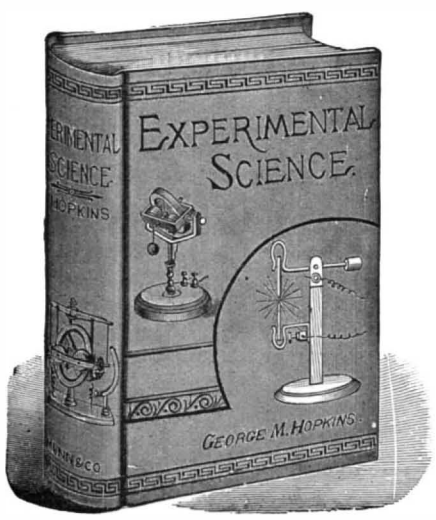

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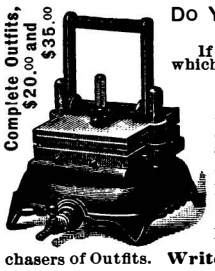

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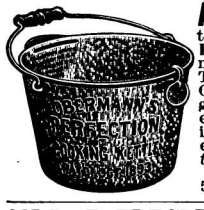

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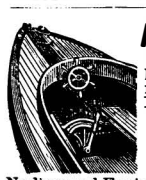

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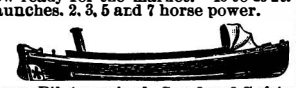

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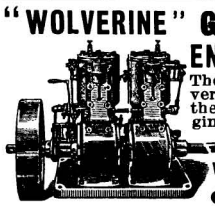

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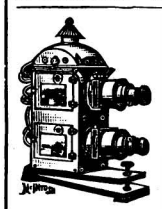

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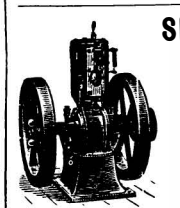

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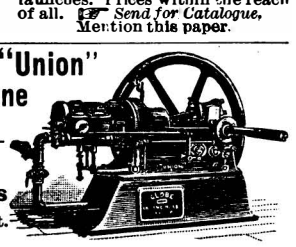

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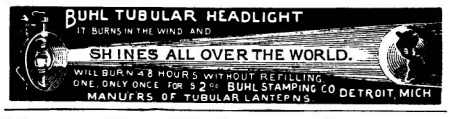
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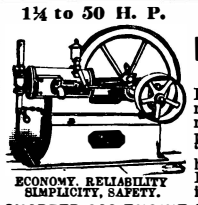

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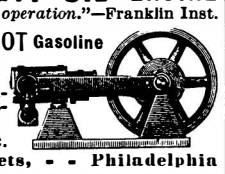

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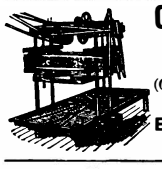

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